38595/B

J. Tennant, 149, Strand, London.

Wm Matthews

BRITISH FERNS.

LONDON:

E. NEWMAN, PRINTER, 9, DEVONSHIRE STREET, BISHOPSGATE.

82730.

A

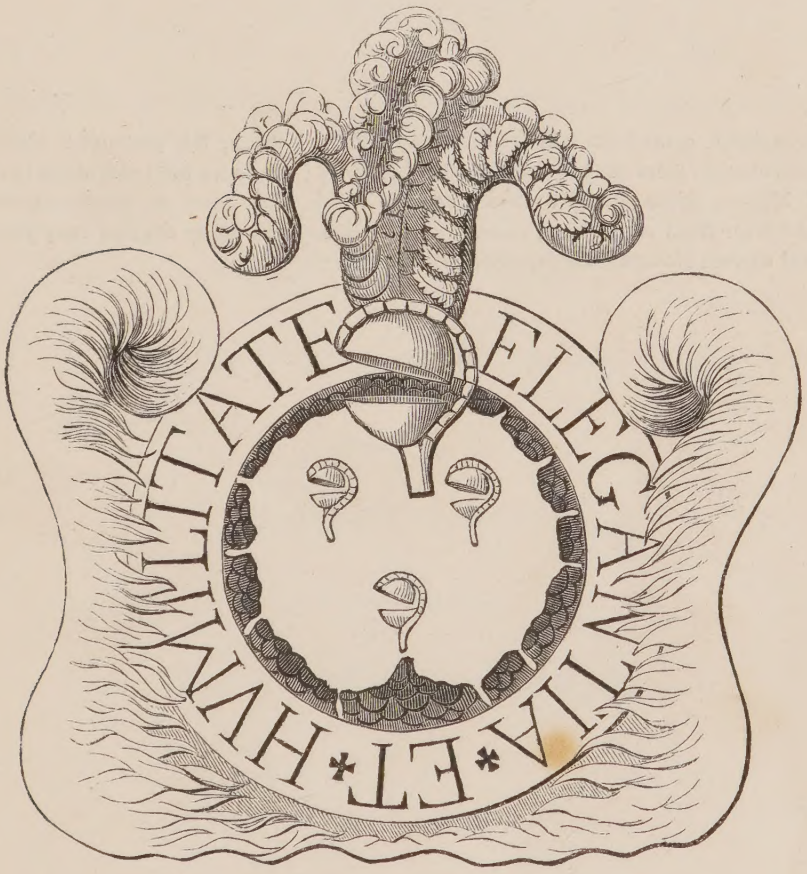
HISTORY OF BRITISH FERNS,

AND

ALLIED PLANTS.

BY

EDWARD NEWMAN, F.L.S., Z.S., &c.



LONDON:

JOHN VAN VOORST, PATERNOSTER ROW.

M.DCCC.XLIV.

WELLCOME
HISTORICAL
MEDICAL
LIBRARY

Monographers, come from whence they may, have, I think, fair pretence to challenge some regard and approbation from the lovers of Natural History; for as no man can alone investigate all the works of Nature, these partial writers may each in his department be more accurate in their discoveries and freer from errors than more general writers, and so by degrees may pave the way to an universal correct Natural History.—*Gilbert White.*

AS

A TRIBUTE TO THE MEMORY

OF

JOHN RAY,

WHOSE MATCHLESS TALENTS FIRST ELUCIDATED

THE

BRITISH FERNS,

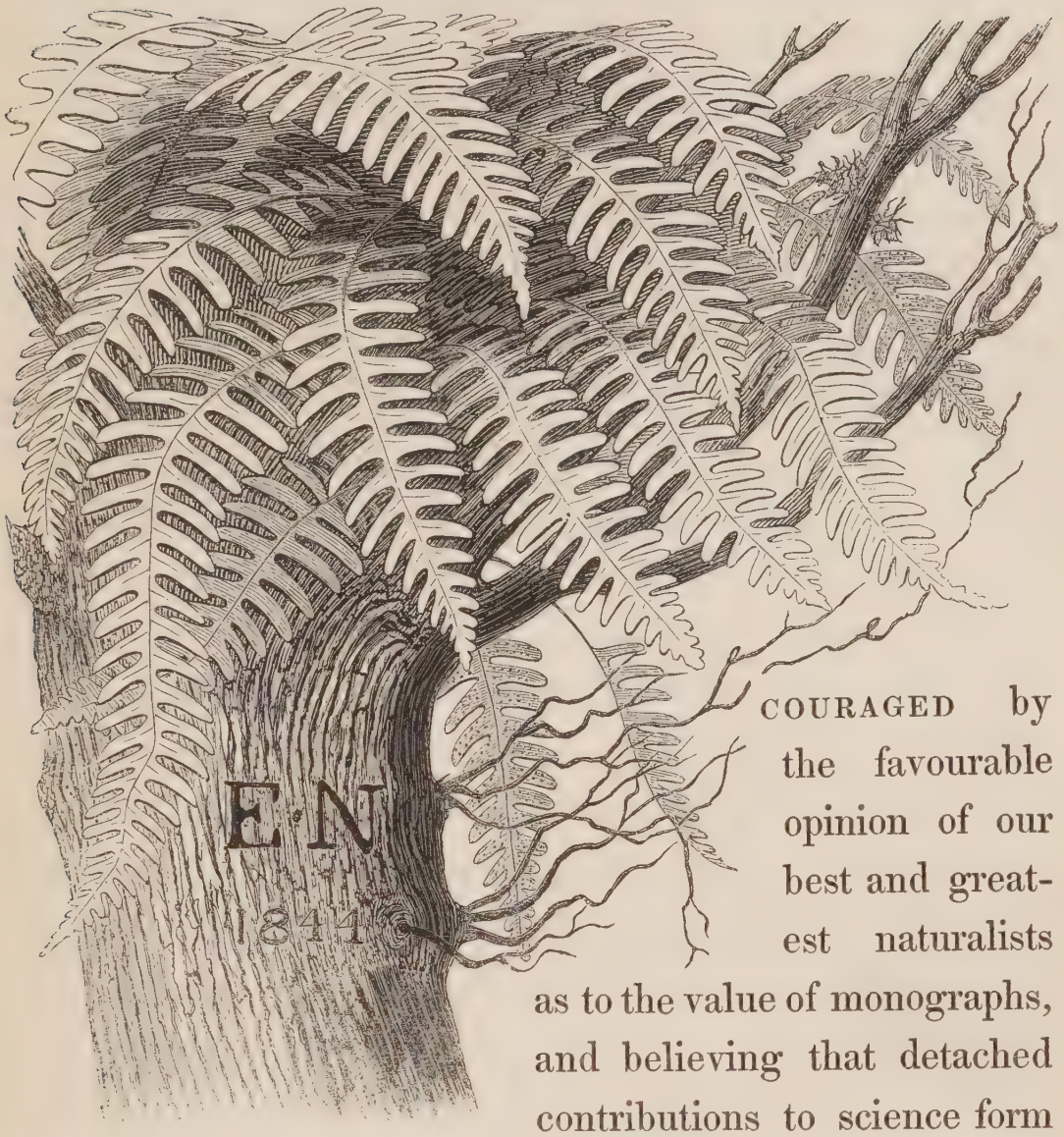
THIS HUMBLE MONUMENT,

INTENDED TO

ILLUSTRATE THE SPECIES,

IS ERECTED BY

AN ARDENT ADMIRER.



ENCOURAGED by the favourable opinion of our best and greatest naturalists as to the value of monographs, and believing that detached contributions to science form the best materials for the construction of more general works, I have attempted, in the following pages, to give such a history of our British Ferns as may hereafter prove valuable to the general writer on Botany, while it more immediately addresses itself to a numerous class of readers, who neither contemplate the perpetration of authorship nor trouble themselves greatly about scientific Botany, but love Ferns because they are beautiful, and because they give zest and interest to many a ramble in the country ;

moreover, the cultivation of Ferns is becoming fashionable. It is no longer confined to the professed horticulturist; but every one possessing good taste has made, more or less successfully, an attempt to rear this tribe of plants. Ferns constitute so beautiful a portion of the creation, — whether they ornament our ruins with their light and graceful foliage, wave their bright tresses from our weather-beaten rocks, or clothe with evergreen verdure our forests and our hedgerows, — that it seems next to impossible to behold them without experiencing emotions of pleasure. Years before Ferns had become to me as friends with "old familiar faces," I could not pass them without turning to feast my eyes on what I thought their excessive loveliness; and there is something to me peculiarly gratifying in watching the growth of each frond when under cultivation, — in tracing it from its first button-like appearance at the head of the rhizoma, through its circinate youth,—so like the classic volute, — to its fully developed and expanded maturity.

It was while wandering among the Welch mountains, in the autumn of 1837, that I first felt any desire to know the names of Ferns. I had often observed the variety that half covered some of those bleak and desolate regions, where fern is cut, dried, and housed as the only litter that can be obtained for horses; but now, for the first time, I gathered hundreds of fronds, and employed the evenings in arranging them into supposed species. I found that three species were abundant in the most dreary and exposed wilds; but where some rill tumbled over a precipi-

tous bank, or a ledge of rocks, keeping the surface in a state of perpetual moisture, half a score others were sure to be growing: in the chasm at Ponterwyd I think I counted fourteen distinct kinds.

Of every species I could obtain, not only the fronds but the roots were carefully conveyed home, and, assisted by Withering and Smith, I set to work, expecting to name them without difficulty; but how shall I express my astonishment, when, after a minute and really attentive investigation, I could only be certain of two species — *Pteris aquilina* and *Polypodium vulgare!* I soon afterwards availed myself of the assistance of my botanical friends, and obtained names for all my Ferns. Since then I have paid some attention to the specific characters, as laid down by our best authors, and I am inclined to doubt whether those most distinctive have been employed. It appears that the manner in which a frond is cut or divided, has hitherto constituted almost the sole ground of specific distinction. Now, we find a great number of specimens in a state of semi-cultivation, *i. e.*, partaking more or less of the influence of the spade, or plough and harrow, and nourished by an almost infinite variety of soils and manures; and we also find amongst such specimens as great a variety of cutting, as we do in the colours of domesticated animals. I think no botanist, who allows his memory to turn to the varieties he has observed of *Lastræa multiflora* and *Polystichum aculeatum*, will for a moment deny this; and yet what botanist has ever presumed to treat of the cutting of the frond in Ferns as of any other than the highest impor-

tance? I entertain a different opinion. I think that mere cutting of frond is of no more value than colour in fowls or cows, and therefore should not be used as the leading character of a species: to distinguish these, I would look for less fickle characters in the figure, position, and covering of the masses of seed, in the habit of the rhizoma, and in the general outline of the frond.

During the summers of 1837-8-9, having many opportunities of obtaining roots of Ferns, I planted them with care, for the purpose of obtaining a more correct knowledge of the variations to which they were subject; and as I have heard a great deal of the difficulty in cultivating Ferns, and have met with none myself, I will here describe the management which I have found successful.

Whenever I met with a Fern which I thought would be worth the trouble of removing, I invariably noticed the situation in which it grew — whether it was naturally exposed to sun, rain and wind; whether it grew on a horizontal or perpendicular surface; and whether its fronds were erect, horizontal, or pendulous; whether its roots enjoyed depth of earth, or were simply

"Moored in the rifted rock.'

And having thus minutely observed every natural peculiarity, my next object, when the Ferns had reached home, was, to copy Nature as closely as I could; not, indeed, to imitate rocks and mountains by a structure of flints, Bath-bricks, or clinkers, but simply by supplying to each, as far

as possible, the adjuncts which it naturally enjoyed: thus, some bog-lovers, as *Osmunda regalis*, were placed in slight excavations, which I could readily flood with water; others, as *Ceterach officinarum*, which, almost deserting its native station on rocks, has established itself on our mortared walls, I supplied with crumbled mortar, carefully introduced between the stones, and placed the root so that, in all rains and in the constant waterings in which ferneries rejoice, it should remain as dry as possible; for to the roots of some Ferns wet is as injurious as it is needful to the well-being of others. With regard to *Osmunda*, and those plants which require perpetual moisture, the only effectual way of supplying it, is by planting them in a vessel (a grape-jar for instance) filled with bog-earth; this could be immersed in the ground, and any degree of moisture might be maintained without trouble, as the vessel would prevent it from being rapidly absorbed by the surrounding earth.

A fernery, to supersede the necessity for care and attention, should possess abundant space, a pure atmosphere, a variety of surface, natural shade, and a natural fall of water; but all these advantages can be so closely imitated, that I believe there scarcely exists in the United Kingdom a plot of a few square yards in which the zealous cultivator might not accomplish everything he desired, and, with attention, cause the artificial to exceed in beauty the natural fernery; for the destruction by frost and wind, both highly injurious to Ferns, may, with a little management, be completely avoided.

In my own fernery I possess but one natural advantage

— that of an atmosphere tolerably free from smoke; on three sides, — east, south, and west, — there is a straight brick wall; on the north there is an artificial mound, tolerably covered with shrubs; to the east, beyond the wall, are some large lime-trees, which completely shut out a summer morning's sun; at noon, the south wall casts its shadow on those Ferns which are planted purposely within its reach, and these can only be illuminated for a single half hour, when a summer sun is sinking unclouded in the north-west. Within the space enclosed by the walls are sundry buildings, by courtesy denominated rock-works, but which are in fact close imitations of the most unpicturesque stone walls that ever deformed the face of a hedgeless country. In Scotland I have seen such walls, when built against a bank to prevent its crumbling into a newly cut road, covered with a continuous garden of our most beautiful Ferns; *Athyrium Filix-femina, Polypodium Phegopteris* and *P. Dryopteris, Lastræa Oreopteris* and *L. multiflora, Cystopteris fragilis,* and *Allosorus crispus,* I have seen crowded together for hundreds of yards: the water from the land above is continually filtering through the walls, and thus the roots are supplied with a perpetual moisture. With a view of imitating this on a small scale, my formal walls have been built; each is slanting at a slight angle from the perpendicular, and they face different points of the compass. One, situate under a thick Portugal laurel, has never yet been visited by a ray of sunshine—

"The beams of the warm sun play round it in vain;"

they cannot reach it; a second enjoys half an hour's sun; a third basks in sunshine till noon; and thus all are varied.

Even with this choice of situation, and after having noted the natural habitat, I find it best to obtain, when possible, a number of roots of the same species, and to plant them in every situation: for instance, I have placed *Ceterach officinarum* and *Scolopendrium vulgare* side by side in the darkest shade and the brightest sunlight; but *Ceterach* loves sun and drought, *Scolopendrium* darkness and moisture; so that where *Scolopendrium* thrives *Ceterach* pines, and where *Ceterach* thrives *Scolopendrium* pines. Thus, by giving to each an abundant choice, you allow it to suit itself with a congenial situation, which is even better than condemning it to the result of observations which may have been erroneous.

Having planted a number of Ferns on these principles of adapting the situation to each, the next grand point is to keep them well watered; and this is best effected by a garden-engine, from which, by a pressure of the thumb on the stream, it may be made to descend in an almost imperceptible shower, which is much more beneficial than a heavy watering. If there has been no rain during the day, the watering should be repeated every evening during the summer; but when the fronds have ceased to grow, when those which are deciduous have disappeared, and those which are persistent have assumed their full size and substance, then should nothing more be done to urge them forward, for all require a period of rest; a season in which the sap seems to circulate less freely, and a state of sloth

or torpidity supervenes; this cannot be disturbed or hastened without injuring the strength and vigour of the plant for the ensuing year.

It will be found a great improvement to a fernery to introduce a number of mosses and Marchantiæ: the latter are particularly useful; they speedily cover the earth and stones, and keep the surface in that state of moisture which is so very advantageous. All kinds of grasses, on the contrary, should be exterminated, for they are of so rapid a growth, and vigorous a nature, that they quickly overpower, weaken, and finally destroy the more delicate among the Ferns.

There is one species,—*Trichomanes speciosum*,—which in some localities has its fronds always wet; it generally grows within the spray of waterfalls, or in similar situations, where it is constantly supplied with the needful moisture. This I find a most difficult situation to imitate, but it may be managed by suspending above the Fern a vessel containing water, which shall be allowed to drop slowly on a stone, or other hard substance in the neighbourhood of the plant, the fronds of which will be wetted by the sprinkling caused by each drop. *Polypodium Phegopteris* and *Cystopteris fragilis* benefit greatly by a similar treatment.

There is one Fern, — *Asplenium marinum*, — which hitherto I have failed to cultivate in anything like its natural luxuriance: this species grows on the most exposed rocks on our bleakest shores, and yet I believe it has never been cultivated in the open air with success: in a tempe-

rature of 70° Fahr. it will grow with vast rapidity; and with a lower temperature, with artificial protection, it also answers very well.

Adopting this plan of cultivation, I have possessed the opportunity of observing the changes that took place, and of watching, as it were, the progress of variation. I have pressed fronds from the same root for three successive years, and have found variations abundantly adequate to the establishment of species quite as distinct as many of those in the English Flora; and I consider all that cultivation, as I have explained it, can accomplish for any plant, is *to hasten or delay those changes to which that plant is by nature liable:* it cannot increase or diminish the number of actual species. In those species liable to great extremes in the cutting of their fronds, I have observed that a soil composed of decaying wood, abundantly supplied, and completely covering the roots, hastens a development of the most divided form which they can possibly assume, while a mixture of sand and stones, and a deficiency even of these, retards the development, and not unfrequently causes the plant to return to a more simple form.

Besides the British Ferns, all the species indigenous to the northern regions of America, Europe, and Asia, may be grown in the open air, and without protection, excepting from severe frost, when they should be covered with straw, matting, or dried tan, thus supplying that warm clothing of snow which protects them from extreme cold in their native habitats. But if we advance one step, and restrain

the free communication with the outer air, then there seems to be no limit to the species we may introduce — the beautiful productions of the tropics may be brought to our doors.

How often has it been repeated, that he who causes an ear of wheat to grow where it never grew before, is one of the greatest benefactors to mankind! If this be true, must we not also regard as a benefactor the man who has introduced the loveliest scenery of nature into the most crowded streets of our sooty and muddy metropolis! who has clothed our courtyards, aye, even our windows, with a perpetual summer! who has realized that sweet land of a poet's imagination —

"Where a leaf never dies in the still blooming bowers!"

It is Mr. Ward* who has effected this. His plan, although improved, I may perhaps say perfected, by various accessories, depends primarily and fundamentally on protecting the plants from too free communication with the outer air. This end is obtained by the use of glass, the light so essential to vegetation being thus freely admitted. The most ready way to try the experiment is, to procure a glass vessel, for instance, one of those jars used by druggists and confectioners; introduce some soft sandstone, or some light soil, filling one-sixth of the jar with it, and taking care that the earth be very moist, yet allowing no

* See Appendix A.

water to settle at the bottom of the jar; plant a fern in the earth, and then cover the jar with its glass lid, first supplying a slip of wash-leather round the rim of the jar, which will pretty nearly cut off the communication between the internal and external air; no farther attention will be required: the fern will live, thrive, and probably seed, the seed also vegetating, and at last the jar will become too small for its contents; no watering is needed; the moisture in the earth will exhale, condense on the glass, trickle down its sides, and so return to the earth whence it arose.

There is no limit to the application of this principle: instead of a jar, it is easy to construct in the window-sill a box, extending throughout its entire length, the bottom and sides being lined with zinc, to prevent the moisture from damaging the adjoining wood-work; then let the window be a double one, like those in Russia, leaving a space of six or twelve inches between the inner and outer glass. The ferns so planted in the box, which should contain a depth of five or six inches of light sandy earth, will soon fill up the space between the two windows, supplying the most beautiful curtain or blind that could possibly be invented. The plants need not be ferns exclusively; roses, fuchsias, &c., would also thrive; but it must always be borne in mind, that plants requiring a humid atmosphere should not be inclosed with those which prefer aridity: of course the upper sash alone must be made moveable. Extending the plan still farther, a large conservatory may be constructed, or even a large garden, entirely inclosed with glass; all the doors should be fitted with great nicety

and exactness, and would be better if double, and always one of them shut before the other is opened.

Houses on a large scale can scarcely be made sufficiently air-tight to prevent the escape of aqueous exhalations: a leaden pipe, pierced with small holes, should therefore be carried round the building, at as great a height as may be found practicable, and this pipe connected with a reservoir, so that an artificial shower could be produced at pleasure; if an increase of temperature were considered necessary, it might readily be attained by the introduction of hot-water pipes in the usual way.

So great is the advantage of this plan, that the plants of tropical regions can now be cultivated in London with the most perfect success; and, what is of still greater importance, may be conveyed, uninjured by extremes of heat and cold, and without any additional supply of moisture, from the most distant parts of the earth. Mr. Ward, and Messrs. Loddiges of Hackney, have, in their glass cases, transmitted our plants to the most distant countries, and have received the same cases in return filled with valuable exotics, many of which have never previously reached this country in a living state.

But the most pleasing character of this mode of cultivation is, that it can be adapted to any spot that fancy may select: plants in this way may be grown in a drawing-room, without ever making the least litter or apparent untidiness, and without the trouble attendant on watering. If the cases were opened annually it would be sufficiently often, and the decayed fronds, or a too luxuriant growth,

might be removed, and a little water added, if there appeared a necessity for it.

Ferns, mosses, and all kinds of cryptogamous plants, seem to spring up spontaneously in these cases ; and the surface of the earth speedily becomes clothed not only with a beautiful but a highly interesting vegetation. The raising of ferns from seed, in the manner hereafter described, offers a ready way of ascertaining beyond question the value and limits of each species.

It has often been considered somewhat unaccountable that plants should thrive when deprived of air. I believe a philosopher would smile at the idea of a vacuum existing in a vessel containing abundance of earth, water, and living vegetables ; but let us consider the subject without reference to any philosophical inquiry. It must, then, be understood as an unquestionable fact, that in closing the vessel no attempt is ever made to exclude the air which it contains, or even by any experiment to diminish its quantity ; therefore, admitting the property of air to press equally in all directions, we must take it for granted that there is as much air in the vessel as in an equal space outside the vessel ; and so, the idea that the ferns are living without air not being based on fact, requires no refutation. The next source of wonder is, that a fern should thrive deprived of that fresh air, or that change of air, which, in a state of nature, it is constantly enjoying. The term *fresh air*, though so continually used, has no very definite meaning. If it applies to air that has not been breathed by animals, I believe we shall find that animals alone are

injured by respiring air from which oxygen has been abstracted by previous respiration: change of air, whether beneficial or otherwise, does take place, for our contrivances, although they retard, cannot preclude a change. Thus the supposed anomalies of plants living without air, or without change of air, are either dissipated or softened down: we will inquire whence arise the benefits of this plan.

In London the air is loaded with particles of soot, than which there is scarcely any substance more injurious to vegetation; a single "smut," as it is usually called, causes a yellow mark wherever it has adhered to a leaf; and the result of an atmosphere loaded with smuts is the rapid destruction of the leaves, so that the leaves of London trees are never in a perfectly natural state; they differ in appearance, colour, and *health*, so to speak, from the leaves of country trees: the deleterious effects of London smut on the leaves influence the growth of the tree itself, and London trees are invariably of slower growth, and of less healthy appearance, than those in the country. By the plan of cultivating plants in closed vessels this injury is entirely avoided, the smut and all solids borne by the atmosphere being completely excluded, and forming a thick deposit on the glass; if the vessel employed be a bell glass inverted over the plant, then every accession of atmospheric air must take place through the earth, and consequently no portion of its impurities will be deposited on the plant. Mr. Ward is perfectly right, when he attributes the sickly state of *London* vegetation to "the depressing influence of the fuliginous matter with which the

atmosphere in which he lives is surrounded:" but it appears that other causes have been sought in the presence of gases injurious to vegetable life. This theory I shall now examine.

Mr. Ellis,* in an excellent paper read to the Botanical Society, in June, 1839, and published in the fifteenth volume of the 'Gardener's Magazine,' objects to the idea previously expressed by Mr. Ward, of the deleterious influence of this smut or fuliginous matter, and goes on to explain at length, that "the real mode in which such an atmosphere proves injurious to vegetation was first shown by the experiments of Drs. Turner and Christison, which were published in the ninety-third number of the 'Edinburgh Medical and Surgical Journal.' They ascertained that it is not simply to the diffusion of fuliginous matter through the air, but to the presence of sulphurous acid gas, generated in the combustion of coal, that the mischief is to be ascribed. When added to common air, in the proportion of $\frac{1}{5000}$ or $\frac{1}{10000}$ part, that gas sensibly affected the leaves of growing plants in ten or twelve hours, and killed them in forty-eight hours or less. The effects of hydro-chloric, or muriatic acid gas, were still more powerful, it being found that the tenth part of a cubic inch in 20,000 volumes of air, manifested its action in a few hours, and entirely destroyed the plant in two days. Both these gases acted on the leaves, affecting more or less their colour, and withering and crisping their texture, so that a

* This estimable and highly intelligent gentleman has since died, lamented by all who knew him.

gentle touch caused their separation from the footstalk; and both exerted this injurious operation when present in such minute proportions as to be wholly inappreciable to the animal senses. After having suffered much injury from these acid gases, the plants, if removed in time, will recover, but with the loss of their leaves. Hence in vegetation, carried on in a smoky atmosphere, the plants are rarely killed altogether, but merely blighted for the season: accordingly, in spring vegetation recommences with its accustomed luxuriance; and as, in many situations, there is at that season, and through the summer, a considerable diminution in the number of coal fires, there will be a proportionate decrease in the production of sulphurous acid gas, and consequently less injury will be done to plants during that season. In winter, too, when coal fires mostly abound, and gas is most abundantly generated, deciduous plants are protected from its noxious operation by suspension of their vegetating powers; but the leaves of evergreens, which continue to grow during that season, are constantly exposed to its action when present in its greatest intensity. Accordingly, in many of the suburban districts around London, especially in the course of the river, where new manufactories are constantly rising up, the atmosphere is so highly charged with noxious matters, that many deciduous plants, and almost all evergreens, cease to flourish, or exhibit only a sickly vegetation. In an interesting biographical sketch of his late lamented friend Dr. Turner, Professor Christison confirms, by subsequent experience, the opinion formerly given respecting the noxious operation

of the sulphurous and muriatic acid gases on plants; he describes their action as so energetic, that, in the course of two days, the whole vegetation of various species of plants may be destroyed by quantities so minute as to be altogether inappreciable by the senses. On two occasions he was able to trace the identical effects of the same kind of works (the black ash manufactory) on the great scale which his friend and himself witnessed in their researches. In one instance, the devastation committed was enormous, vegetation being for the most part miserably stunted, or blasted altogether, to a distance of fully a third of a mile from the works, in the prevailing direction of the wind."

Mr. Ellis's is an extremely pleasing and well-written paper; it is full of very valuable information, collected with industry, and arranged with care; the experiments to which he refers are of undoubted authority, and strictly applicable to general principles in the way intended by their various authors. I think they will be received as conclusive by that large class of readers which prefers the dictum of a philosopher to the fatigue of inquiry; but never by that limited class—that troublesome and inquiring class—which takes nothing for granted, which, in reading a well-arranged and instructive series of illustrations, argumentatively applied, is continually asking, "Quo tramite tendis?" And when, at length, the goal is discovered to which Mr. Ellis is conducting it—when he briefly concludes, "Against the evils arising from such a vitiated atmosphere, the plan of Mr. Ward provides effectual protection, as the success of his establishment amply demonstrates," then this little jury

pronounces instantly a verdict of "Not Proven." Mr. Ellis seems scarcely aware of the extreme difficulty of maintaining any essential difference between the component parts of atmospheric air on the internal or external side of any given partition. He seems scarcely aware that Mr. Ward's establishment—the success of which he justly considers beyond dispute — communicates with the surrounding murky and foul atmosphere by means of a glass door, of the usual construction — a door opened by every visitor on entering this paradise —

"Exiguus spatio, variis sed fertilis herbis:" *

And again by every visitor on returning; and that these openings are much too frequent to allow the possibility of maintaining any difference in the proportions of the gases composing the internal and external air, even supposing that the air would not so far elude Mr. Ward's care, were the door constantly shut, as not to insinuate itself through the broken panes and other apertures which every glass house must possess. Before assigning the excess of sulphurous and muriatic-acid gases as the deleterious property of the atmosphere obviated by Mr. Ward's plan, Mr. Ellis should have shown us that this excess was so obviated. He should have shown us that the deleterious gases did not exist within; he should have tested the interior, and given us the result; he should have told us by what mystic character engraved on the threshold these gases were scared away; in short, he should have done what he has not done

* This line, from the Moretum of Virgil, is over the door.

—he should have analyzed facts rather than assumed them. The small inquiring class, finding that this important link in the chain of argument is deficient, will be apt to think that the lapse of that single link sets adrift the entire cargo of conclusions.

Having dismissed the gases with the alternative, that either they *do not* exist in any undue proportion in Mr. Ward's fernery and its neighbourhood, or that they *do* exist, and *are not* injurious to vegetation; having seen also that fuliginous matter *does exist* in the atmosphere to a great extent, that *it is* highly injurious to the growth of vegetables, and that *it is excluded* by Mr. Ward's plan, we shall perhaps be expected, without further inquiry, to conclude that in the exclusion of fuliginous matter rests the whole secret of its effect. To this I must demur, or the use of these closed cases would be confined to London and similar smoky atmospheres; whereas it is well known the sphere of their utility is universal. Every cultivator in the country could adduce his proofs of this. I will cite one only.

On a hot day in the summer of 1837, I brought home in a tin box about a dozen seedlings of *Lastræa multiflora*, which I had picked out of moss; each had a single frond of very small size, and extremely minute, white, and delicate roots. Having a wide-mouthed phial at hand, I put in it a small quantity of very wet earth; and then passing a pin through the single frond of one of the seedlings, and pinning it to a cork previously covered with wet wash-leather, I fixed the cork firmly in the phial, and left the

fern hanging at the head of the pin with its roots downwards. Some hours afterwards I looked at my little fern, and found it exhibited no symptoms of withering; whereas the other seedlings, left carelessly on the ground beside the phial, were completely dead, and crumbled to powder between the finger and thumb. I hung up the phial by a string to a nail in the garden wall, and here it was hanging twelve months afterwards. The cork was fastened exactly as I left it, but the phial was filled with something green, which, on taking it out, proved to be a plant of the common chickweed, but to my great joy the little fern still hung from the pin; its roots were longer, it had made two fronds, and the original frond had withered, but was still strong enough to support the fern. This instance is as good as a thousand. The exposure of the roots, which is no part of Mr. Ward's plan, still adds a proof of its efficacy. The plant could not have lived one day so exposed in the open air; in the phial it had lived a year, had renewed its fronds, and looked healthy. How was this effect produced?

Who has regarded Nature without perceiving the word CHANGE legibly engraven on every object? Throughout creation there is a perpetual decay, and a perpetual renovation. Death is the result of life, for life contains within itself the germ of death. This fact is so obvious, that it were idle to adduce proofs. There are many active agents in this change; and it may be observed, that the office of every agent is to hurry forward the eternal round: the sun is equally the source of life and death: wind, rain, heat,

cold, all are perpetual agents in this one work. If we seek for the accessory circumstances most favourable to the rapid and healthy growth of ferns, and refer for the information to Nature herself, we shall generally find them in protection from the sun's rays, in the uniformity and excess of atmospheric humidity, in the absence of extremes of heat and cold, in the gradual transition from one to the other, when these extremes do occur, and, finally, in that perfect stillness of the atmosphere which is rarely realized in Nature, except in caves, fissures of rocks, wells, and a few similar situations: the opposites of all these are the agents of decay and destruction,—the excess of atmospheric aridity, sudden alterations in the temperature, as in the frosts of spring, excessive heat, high and boisterous winds. Were not this law of destruction in perpetual operation, as well as the law of renovation — were they not invariably linked as it were hand in hand, the surface of the earth would become in one extreme a desert, untenanted by living things, in the other a self-destructive crowd.

Returning to the phial, and therefore to all closed vessels or buildings, we cannot fail to perceive, that while all the agents of life — all the vivifying principles — are allowed the fullest scope for their operations; the destructive ones are in a greater or less degree excluded: Nature is still at work; no particle of the benefit results from human skill; we add no gases to those around us in order to make the air more nourishing; we subtract none to make it more pure. Atmospheric humidity is one of the most important

agents in the vitality and luxuriant growth of ferns; and this is attained in closed cases, or under bell-glasses, in such perfection, that the most moisture-loving of all our species — *Trichomanes speciosum*, of which I have before spoken as delighting in the spray of water-falls — not only lives but thrives. Mr. Ward has this plant growing with a luxuriance and vigour that can seldom be exceeded in a state of nature. To the rapid transitions from heat to cold, so common in our climate, and so particularly injurious to tender vegetables, these cases offer a complete barrier; for experiments prove, beyond question, that the atmosphere within the glass retains its degree of temperature very long after a change has taken place in the air that surrounds it, and excess of cold, accompanied by perfect stillness, is incomparably less injurious than when coupled with rapid motion. Thus our travellers in Polar regions speak of intense cold, as indicated by the thermometer, having been scarcely inconvenient to them if the atmosphere were perfectly still; but if the wind rose, although the quicksilver rose simultaneously, as was almost invariably the case, the cold was most distressing. In England, if Fahrenheit's thermometer be at 30°, we walk about or stand exposed to it without any sensation of pain, but if we face it in travelling by railway at the rate of thirty miles an hour, the cold becomes almost intolerable. In fact, it has been abundantly proved by experiment, that a much greater extreme of heat or cold may be borne by plants, by animals, and even by the human frame, if both the atmosphere and the objects of experiments be in a

state of perfect quiescence. In closed cases we thus not only avoid rapid changes of temperature, but the active motion in extremes of temperature, which is the most injurious property of such extremes. The deleterious effect of boisterous winds on the fragile fronds of ferns needs no exemplification; it is so great, that if a specimen of *Cystopteris* be moved from its protected habitat, and placed where it may receive the full force of the wind, that alone will, in a few weeks, work its utter destruction: to such a plant how grateful must be the motionless atmosphere thus provided!

The solution of the problem appears to me to be simply this: that while the power of destructive natural agents is restrained, that of beneficial natural agents is retained, and its efficacy ensured.

Carrying out the system, nothing is more easy than to raise any species of Fern from the seed, which every herbarium affords abundant opportunity of procuring; and thus Ferns from every country may be assembled in our houses, with even less trouble than by transporting the roots in cases. The seeds should be first detached from the frond by gently rubbing the clusters of capsules, and then shaken on a common plate; next, having procured some light sandy earth, crumble it on the plate, and shake it about for a minute or two, when all the seeds will be found adhering to the little masses of earth; spread this earth, as lightly as may be, over other light sandy or loamy earth, either in a garden or in a flower-pot, in doors or out, always taking care very carefully to cover the seed with a

bell glass, or other glass cover, excluding, as completely as possible, communication with the outer air. In a few weeks the young Ferns will come up abundantly, in a sinuous horizontal frond, closely resembling that of *Marchantia;* but in a very short time other fronds will succeed, having the true characters of Ferns.

In my descriptions I have endeavoured, as far as practicable, to combine simplicity with uniformity. I am aware that some readers may possibly object to the occurrence of Latin or technical words, but these are never used when a common English word would answer the purpose. I think it must be obvious to the understanding of every one that it is needful to have a term that shall be sufficiently precise to express what is intended, and I believe our best botanists aim at nothing more, although they are frequently charged with the invention of unintelligible words. I trust that the technical words used in the present volume will be found not only few in number, but will be rendered perfectly intelligible by the following explanation. I have treated every fern as having three parts, — the *roots,* the *rhizoma,* and the *fronds:* if the reader will turn to pages 93, 115 and 131, he will see examples of these three parts; in every instance the worm-like stem running horizontally or across the page is the *rhizoma;* the upright stems which ascend from this, together with the apparent leaf at their summit, are the *fronds;* and the fibres are the *roots.* The rhizoma in all these instances is said to be *creeping,* and is in fact an underground stem: when this is the case the

fronds rise from it separately, and often at considerable distances from each other. The rhizoma is sometimes said to be tufted; instances of this are shown at pages 163, 208 and 249: a tufted rhizoma is robust, compact and erect; it bears a tuft of fronds at its extremity. The *fronds* are something like deciduous branches; they cannot with propriety be called leaves, although some modern botanists have attempted to introduce that name: they generally consist of a stem and a leafy portion; the stem being partially naked and partially continued through the leafy portion to its extremity. The whole of this stem is often called the *rachis*, but our most able botanists divide it into two parts, calling the lower portion where naked the *stipes*, and the upper portion the *rachis*. I have not used these words, but have always spoken of it as a stalk or stem.

The fronds of ferns are generally very much divided, and are usually described by the amount or character of divisions. The fronds at page 289 are *simple* or undivided, those at pages vii and 293 are deeply notched or *pinnatifid*, and those at pages 137, 143, 163, 273, 281 and 285, are called *pinnate*, the leaf-like divisions being termed *pinnæ*. The *pinnæ* are more or less divided: fig. *b* at page 187 represents a *pinnatifid pinna*, and at page 209 all the *pinnæ* are *pinnate*, or completely divided into a series of leaf-like divisions called *pinnules*, and these pinnules again are either simple, pinnatifid, or pinnate.

The seed of ferns are usually produced in little capsules, surrounded by a jointed ring, which terminates below in a short stalk; the capsule when ripe splits open, and the

elastic ring, by a series of jerks, throws out the seed : three of these capsules are represented in the centre of the figure on the title-page. These capsules are also called *thecæ* and *sporangia :* they are generally seated on the back of the frond in clusters, often called *sori ;* but I have carefully avoided the use of these words, thinking the English ones —i. e. *capsules* and *clusters*—better in every respect ; they are more correct, more expressive, and more intelligible. The clusters of capsules are frequently hidden by a thin membranous cover, which I have called an *involucre ;* it is often called an *indusium :* the white space in the title-page, in which the three capsules are placed, shows the shape of one of these involucres.

And now I believe I have only to offer my best thanks to those botanists who have rendered me such zealous and important assistance during the progress of my work ; and I trust that my coadjutors will not think me guilty of unkindness or ingratitude in substituting this general acknowledgment for individual thanks. Were I to make out a list of *all* the correspondents who have assisted me it would be wearisome from its length, and I cannot consent to make a selection of particular names when the object of all has been the same : as a matter of course the communications of some correspondents have been more available than those of others, yet the same spirit of kindness and goodwill has influenced all, and all therefore have an equal claim on my sincere and heartfelt gratitude. I have endeavoured to exercise the greatest care in acknowledging every communication in its proper place.

GENERAL INDEX.

Note. — The names in *Italics* indicate the genus in which the species is or has been placed. The termination of specific names occurring *in this Index* is not altered in accordance with the gender of the genus. Names employed before the binominal nomenclature of Linneus, and then discontinued, are not indexed. When *var.* occurs after a name, it is supposed to rank as a variety only.

A.

Abbreviatum, *Polystichum*, 202
Acrostichum, 14, 140
Aculeatum, *Aspidium*, 169, 175
„ *Polypodium*, 11, 170
„ *Polystichum*, 169
Acutum, *Asplenium*, 423
„ „ var. 259
Adiantum, 8, 83
Adiantum-nigrum, *Asplenium*, 255, 423
Adder's-tongue, 349
Alatum, *Hymenophyllum*, 311
„ *Trichomanes*, 311
Allosorus, 13, 103
Alpinum, *Acrostichum*, 139, 144
„ *Cistopteris*, 149
„ *Cyathea*, 419
„ *Equisetum*, var. 48
„ *Lycopodium*, 365
„ *Woodsia*, 143
Alternifolium, *Asplenium*, 265
„ *Amesium*, 10
Amesium, 10
Andrewsii, *Trichomanes*, var. 315
Angulare, *Aspidium*, 173
„ *Polystichum*, 173, 175
Angustata, *Cystea*, 149, 156
Annotinum, *Lycopodium*, 361
Anthriscifolia, *Cyathea*, 418
Aquilina, *Pteris*, 93
Arenarium, *Equisetum*, 41
Arvense, „ 77, 413
Arvonicum, *Polypodium*, 139, 140
Asplenium, 10, 249, 422
Athyrium, 238, 420

B.

Beech Fern, 115
Black Spleenwort, 255
Blechnum, 89
Boreale, *Blechnum*, 89
Botrychium, 15, 337
Brakes, common, 93
„ Rock, 103
Bree's Fern, 225
Brevisetum, *Trichomanes*, 305
Breynii, *Asplenium*, 266
Bristle fern, 305
Brittle fern, 149

C.

Calcareum, *Polypodium*, 131
Callipteris, „ 12, 205
„ *Lastræa*, 12
Cambricum, *Polypodium*, var. 114
Campanulatum, *Equisetum*, 41
Capillus-Veneris, *Adiantum*, 83
Ceterach, 293
„ *Asplenium*, 9, 300
„ *Grammitis*, 9, 302
„ *Gymnogramma*, 9
„ *Notolepeum*, 9
„ *Scolopendrium*, 293
Cistopteris, 149
Clavatum, *Lycopodium*, 353
Club-moss, Common, 353
„ Fir, 375
„ Interrupted, 361
„ Marsh, 369
„ Prickly, 371
„ Savin-leaved, 365

Club-mosses, 15
Collina, *Lastræa*, 224, var. 222
Common Brakes, 93
„ Club-moss, 353
„ Spleenwort, 285
Concavum, *Aspidium*, 229
Convexum, *Athyrium*, var. 245
Cornfield Equisetum, 77
Crispus, *Allosorus*, 103
„ *Cryptogramma*, 103
„ *Onoclea*, 107
„ *Osmunda*, 14
„ *Pteris*, 103
Cristata, *Lastræa*, 204
„ *Aspidium*, 204
„ *Polypodium*, 12, 205
Cryptogramma, 103
Cyathea, 417
Cynapifolia, *Cyathea*, 419
Cystea, 149
Cystopteris, 13, 149

D.

Dentata, *Cistopteris*, 149
„ *Cystea*, 149, 154
„ *Polypodium*, 241
„ *Athyrium*, var. 243
Dilatata, *Lastræa*, 208, 209
„ *Aspidium*, 216
Drummondii, *Equisetum*, 63
Dryopteris, *Lastræa*, 13
„ *Polypodium*, 123
„ *Polystichum*, 128
Dutch rush, 17
Dumetorum, *Aspidium*, 216, 232

E.

Eburneum, *Equisetum*, 71
Ehrhart's fern, 203
Elongatum (Willd.), *Equisetum*, 26
„ (Hooker), „ 25
Equisetum, 6, 17
„ Corn-field, 77
„ Great, 67
„ Mackay's, 25
„ Marsh, 43
„ Rough, 17
„ Shady, 63
„ Variegated, 31
„ Water, 51
„ Wilson's, 39
„ Wood, 59
Europæum, *Trichomanes*, 311

F.

Filix-femina, *Aspidium*, 238
Filix-femina, *Asplenium*, 238
„ *Athyrium*, 238, 421
„ *Polypodium*, 11, 240
Filix-mas, *Aspidium*, 197
„ *Lastræa*, 197
„ *Polypodium*, 12
Filmy fern, Tunbridge, 321
„ Wilson's, 325
Filmy ferns, 14
Fir Club-moss, 375
Flowering fern, 331
Fluviatile, (Linn.), *Equisetum*, 51, 413
„ (Smith) „ 67
Forked Spleenwort, 269
Fragilis, *Cistopteris*, 149
„ *Cyathea*, 417
„ *Cystea*, 149, 155
„ *Cystopteris*, 149
„ *Isoetes*, var. 390
Fragrans, *Nephrodium*, 195
„ *Polypodium*, 188, 193, 195

G.

Germanicum, *Amesium*, 10
„ *Asplenium*, 264, 265
Glabella, *Woodsia*, 144
Globulifera, *Pilularia*, 393
Gracilis, *Isoetes*, var. 390
Grammitis, 302
Great Equisetum, 67
Green Spleenwort, 281

H.

Hard fern, 89
Hart's-tongue Spleenwort, 289
Hemionitis, *Scolopendrium*, 291
Hibernicum, *Trichomanes*, 311
Holly fern, 163
Hudson's Spleenwort, 249
Hyemale, *Equisetum*, 17, 41, 411, 414
Hymenophyllum, 14, 321
Hyperboreum, *Acrostichum*, 14, 146
„ *Polypodium*, 148
„ *Woodsia*, 143

I.

Ilvense, *Acrostichum*, 13, 139
„ *Polypodium*, 139
„ *Woodsia*, 137
Incisum, *Polypodium*, 241
„ *Athyrium*, var. 243
Interrupted Club-moss, 361
Inundatum, *Lycopodium*, 369
Irriguum, *Aspidium*, 245
Isoetes, 16, 381

L.

Lacustris, *Isoetes*, 381
Lady-fern, 237
Lanceolatum, *Asplenium*, 11, 249
Lastræa, 11, 183
Limosum, (Linn.), *Equisetum*, 7, 56, 58
„ (Smith), „ 51
Linearis, *Lastræa*, var. 209
Lobatum, *Aspidium*, 169, 176
„ *Polypodium*, 170
Lomaria, 8, 89
Lonchitidoides, *Polystichum*, var. 178
Lonchitis, *Aspidium*, 163
„ *Polypodium*, 11, 166
„ *Polystichum*, 163
Lunaria, *Botrychium*, 337
„ *Osmunda*, 15, 344
Lycopodium, 16, 353, 423

M.

Mackaii, *Equisetum*, 6, 25, 411
Mackay's „ 25
Maidenhair, True, 83
Male Fern, 197
Marinum, *Asplenium*, 275
Marsh Club-moss, 369
„ Equisetum, 43
„ Fern, 183
Melanocaulon, *Asplenium*, 286
Molle, *Athyrium*, 11, 241, 420
„ „ var. 242
„ *Polypodium*, 240
Montanum, *Aspidium*, 160
„ *Asplenium*, 256
„ *Cyathea*, 160
„ *Cystopteris*, 159
„ *Polypodium*, (Allioni), 13, 189
„ „ (Roth), 188
„ „ (Vogler), 12
„ *Polystichum*, 188
Moonwort, 337
Mountain fern, 187
Multiflora, *Lastræa*, 216
„ *Polypodium*, 12
„ *Polystichum*, 216
Multiforme, *Equisetum*, 27

N.

Nana, *Lastræa*, var. 222
Notolepeum, 9
Nova-Boracensis, *Lastræa*, 188
Nudum, *Equisetum*, var. 49

O.

Oak fern, 123
Obtusum, *Asplenium*, 422
„ „ var. 258
Odoriferum, *Aspidium*, 188
Officinale, *Scolopendrium*, 290
Officinarum, *Ceterach*, 293
„ *Asplenium*, var. 258
Ophioglossum, 349
Oreopteris, *Aspidium*, 188
„ *Lastræa*, 188
„ *Polypodium*, 188
Osmunda, 15, 332
Ovatum, *Athyrium*, 242, 420

P.

Palustre, *Equisetum*, 43, 413
„ *Thelypteris*, 186
Phegopteris, *Lastræa*, 13
„ *Polypodium*, 13, 115
„ *Polystichum*, 121
Phyllitis, 9
„ *Scolopendrium*, 290
Pillwort, 393
Pilularia, 16, 393
Polypodies, 11
Polypodium, 14, 111
Polypody, 111
Polystachion, *Equisetum*, var. 47
Polystichum, 11, 162, 163
Prickly Club-moss, 371
„ Fern, 169
Pteris, 8, 93
Pyxidiferum, *Trichomanes*, 307

Q.

Quillwort, 381
Quillworts, 16

R.

Raiana, *Woodsia*, 140
Ramosissimum, *Equisetum*, 26
Ramosum, *Equisetum*, 30, 41
„ *Asplenium*, var. 284
„ *Trichomanes*, 284
Ray's Woodsia, 137
Recurvum, *Aspidium*, var. 228
„ *Lastræa*, 226
Regalis, *Osmunda*, 332
Regia, *Cyathea*, 418
„ *Cystea*, 149, 157
Reptans, *Equisetum*, 33, 41
Rhæticum, *Athyrium*, 242, 421
„ *Polypodium*, 231, 240
Rigid fern, 191
Rigidum, *Aspidium*, 192

Rigida, *Lastræa*, 192
„ *Polypodium*, 12
Robertiana, *Lastræa*, 13
„ *Polypodium*, 13
Rock Brakes, 103
Roth's fern, 215
Rough Equisetum, 17
Rue-leaved Spleenwort, 261
Rutaceum, *Botrychium*, 347
Ruta-muraria, *Amesium*, 10
„ *Asplenium*, 261

S.

Savin-leaved Club-moss, 365
Scaly Spleenwort, 293
Scirpoides, *Equisetum*, 34, 41
Scolopendrium, 289
„ *Asplenium*, 10, 290
„ *Phyllitis*, 10
Sea Spleenwort, 275
Selaginoides, *Lycopodium*, 371, 423
Selago, *Lycopodium*, 375
Septentrionale, *Acrostichum*, 10, 272
„ *Amesium*, 10
„ *Asplenium*, 269
Shady Equisetum, 63
Smith's fern, 131
Speciosum, *Trichomanes*, 305
Spicant, *Blechnum*, 90
„ *Lomaria*, 8, 89
„ *Osmunda*, 8
Spinosa, *Lastræa*, 209
„ *Polystichum*, 12, 211
Spinulosum, *Aspidium*, 216
„ *Lastræa*, 208
Spleenwort, Black, 255
„ Common, 285
„ Forked, 269
„ Green, 281
„ Hart's-tongue, 289
„ Hudson's, 249
„ Rue-leaved, 261
„ Scaly, 293
„ Sea, 275
„ Weiss', 265
Spleenworts, 8
Strigosum, *Polystichum*, 195
Sylvaticum, *Equisetum*, 59, 413

T.

Tanacetifolium, *Polypodium*, 222
„ *Polystichum*, 223
Telmateia, *Equisetum*, 67
Thelypteris, 186
„ *Acrostichum*, 12
„ *Aspidium*, 183
„ *Lastræa*, 12, 183
Trapeziforme, *Adiantum*, 279
Trichomanes, 14, 305
„ *Asplenium*, 10, 285
Trichomanoides, *Asplenium*, 286
Trifidum, *Athyrium*, 242, 420
„ *Polypodium*, 241
„ *Athyrium*, var. 242
True Maidenhair, 83
Tunbridge Filmy fern, 321
Tunbridgense, *Hymenophyllum*, 321
„ *Trichomanes*, 323

U.

Umbrosum, *Equisetum*, 63
Unilaterale, *Hymenophyllum*, 328

V.

Variegated Equisetum, 31
Variegatum, *Equisetum* (Smith), 31
„ „ (Weber & Mohr), 33, 41, 411
„ „ (Willdenow), 33
Viride, *Asplenium*, 281
Vulgare, *Polypodium*, 111
„ *Scolopendrium*, 289
Vulgatum, *Ophioglossum*, 349

W.

Water Equisetum, 51
Weiss' Spleenwort, 265
Willdenow's fern, 173
Wilsoni, *Hymenophyllum*, 325
„ *Equisetum*, var. 39, 41
Wilson's fern, 159
„ Filmy fern, 325
Withering's fern, 209
Wood Equisetum, 59
Woodsia, 13, 137, 416
Woodsia, Ray's, 137
„ Bolton's, 143

A HISTORY

OF

BRITISH FERNS, &c.

It is with a feeling of some regret that I am compelled to acknowledge my inability to define, with anything like precision, the group including those plants of which it is the object of the following pages to treat. I can, indeed, plead abundant precedent for associating them together; and I believe it will be the wiser course, in this instance, to be ruled by authority, rather than attempt the defence of a combination, which certainly appears, in some respects, of questionable propriety; and here I must further observe that the arrangement and nomenclature proposed in this Synopsis are but partially adopted in the body of the work.

Linneus proposed for this group of plants the name *Filices*, and placed them as the first order of his twenty-fourth class — Cryptogamia; and by far the greater number of succeeding botanists appear to have approved and followed the same course. I venture however to suggest that the group, in modern classification, is of higher rank than *order*, a term which I propose transferring to its six* principal divisions, as under.

* It may here be remarked that the species of *Chara* form a group very analogous to the *Equisetaceæ*. Lamarck and DeCandolle unite the genera *Chara*, *Nayas* and *Lemna* in a family called *Nayades*, placing it immediately after the *Equisetaceæ*, which they treat as another family of equal value. If this view of the case be correct, we have seven orders of filicoid plants, which follow the law pointed out in my essay, 'The System of Nature,' as constituting three pairs of circumferential and a normal central group; thus: —

1. *Equisetaceæ*, fructification in a catkin at the termination of frond.
2. *Filicaceæ*, fr. in clusters on the back of frond.
3. *Osmundaceæ*, fr. in clusters at the apex of frond.
4. *Ophioglossaceæ*, fr. on a separate branch of frond.
5. *Lycopodiaceæ*, fr. sessile, in the axils of leaves.
6. *Marsiliaceæ*, fr. seated on rhizoma.

Order I. — EQUISETACEÆ.

Semi-aquatic plants, composed of tough fibrous roots, a jointed hollow cylindrical subterranean rhizoma, and erect jointed hollow cylindrical leafless stems, which are generally furnished at each joint with a whorl of jointed hollow angular leafless branches: the fructification is produced in terminal spikes or catkins, and these are either borne at the head of the usual stem or on separate earlier shorter stouter and more succulent stems, which decay immediately after the escape of the seed. Botanists are agreed in placing all the species of this order in the

Genus Equisetum, *Linneus*, the characters of which are consequently identical with those of the order. The British species are

1. Eq. hyemale, fig. p. 17. *Linneus*, Species Plantarum, 1517, and British authors.

†2. Eq. Mackaii, fig. p. 25. Eq. h. var. Mackaii, *Newman*, Phytologist, 305, date 1843. Eq. M. Babington, Manual, 381. Eq. *elongatum*, Hooker, British Flora, 451.

†3. Eq. variegatum, fig. p. 31, var. Wilsoni, p. 39. *Weber & Mohr*, in Botanisches Taschenbuch for 1807, pp. 60 and 447, and Brit. aut.

1st pair	1. Characeæ.	Circumferential.
	2. Equisetaceæ	
2nd pair	3. Marsiliaceæ	
	4. Lycopodiaceæ	
3rd pair	5. Ophioglossaceæ	
	6. Osmundaceæ	
Single	7. Filicaceæ	Central.

† This mark indicates that the plant is introduced doubtfully as a species.

4. Eq. palustre, fig. p. 43, var. polystachion, p. 47, var. nudum, p. 49. *Linneus*, Sp. Pl. 1516, and Brit. aut.
5. Eq. fluviatile, fig. p. 51. *Linneus*, Sp. Pl. 1517. Eq. limosum, Sm. Eng. Fl. iv. 326. Hook. Br. Fl. 450. Bab. Man. 380.

†6. Eq. limosum, fig. p. 58, in vignette (as var. of Eq. fluviatile). *Linneus*, Sp. Pl. 1517. — Since writing my observations on this supposed species, I have been induced to modify my opinion as to the certainty of its being a variety of the preceding: it appears to grow at a greater elevation, to prefer boggy or muddy localities to actual water, and never, under any circumstances, to become branched. I am indebted to Dr. Taylor for specimens from the neighbourhood of Dunkerron, where it grows in such profusion as to be cut and dried for fodder. Dr. Balfour has found it in Scotland. I place it doubtingly as a species.

7. Eq. sylvaticum, fig. fert. p. 59, barr. p. 62. *Linneus*, Sp. Pl. 1516.
8. Eq. umbrosum, fig. fert. and barr. 63, barr. 82, right hand. *Willdenow*, Sp. Pl. v. 3, date 1810. Eq. Drummondii, Hook. Br. Fl. 450. Bab. Man. 380.
9. Eq. Telmateia, fig. fert. p. 67, barr. p. 76. *Ehrhart*, Beitrage, ii. 159, date 1788. Eq. fluviatile, Sm. Eng. Fl. iv. 324. Hook. Br. Fl. 450. Bab. Man. 379.
10. Eq. arvense, fig. fert. and barr. p. 77, barr. p. 82, left hand. *Linneus*, Sp. Pl. 1516, and Brit. aut.

Order II. — FILICACEÆ.

Plants composed of fibrous roots, simple solid rhizoma, and flat leafy fronds which rise with a circinate vernation and bear capsules in clusters on their back or edges. The capsules are provided with an elastic jointed ring. The divisions of this order are still obscure, and require further investigation; the subjoined arrangement results from the combined employment of the characters used by Ray, Linneus, Presl and John Smith.

Family. — Adianteæ.

The ultimate divisions of the frond generally stipitate and

leaf-like but without a midvein: clusters of capsules small nearly circular seated on the reflexed bleached margin: no apparent involucre.

Genus Adiantum, *Linneus.* Characters same as those of the family.

1. Ad. Capillus-Veneris, fig. p. 83. *Linneus,* Sp. Pl. 1558, and Brit. aut.

Family. — Pterideæ.

The ultimate divisions of frond sessile with a distinct midvein, the lateral veins branched united by a distinct marginal vein on which the capsules are seated in a continuous line, and are covered by the bleached reflexed epidermis.

Genus Pteris, *Linneus.* Involucre forming a continuous line beneath the capsules.

1. Pt. aquilina, fig. p. 93. *Linneus,* Sp. Pl. 1533, and Brit. aut.

Family. — Blechneæ.

The ultimate divisions of the frond sessile, having a distinct midvein, the lateral veins anastomose in a linear series on each side of midvein: capsules seated in a continuous line on that side of these anastomosing veins which is nearest the midvein, covered by a continuous linear lateral involucre which opens towards the midvein.

Genus Lomaria, *Willdenow.* Characters as regards the British species same as those of the family.

1. Lo. spicant, fig. p. 89. Osmunda s. *Linneus,* Sp. Pl. 1522. Blechnum boreale, Sm. Eng. Fl. iv. 303. Hook. Br. Fl. 444. Bab. Man. 390.

Family. — Aspleneæ. Spleenworts.

A large and varied group approaching very nearly to the last, but constantly differing: the capsules are seated in *linear* clusters on one *side* of lateral veins, whose direction is always at an angle with the median line of the pinnule, so that in no instance can two or more of these lines of capsules form a continuous

line: each cluster is covered more or less completely by a linear lateral involucre.

Genus, Notolepeum. Midvein of pinnules present, lateral veins alternate branched, branches anastomosing among themselves and with the branches of the next lateral vein: clusters of capsules on the first anterior branch of each lateral vein, and all of them directed towards the apex of pinnule, except in the first lateral veins, both branches of which bear clusters, the anterior cluster directed as usual, but the posterior towards the midrib of the frond, these are therefore placed back to back; each cluster is accompanied by a narrow and nearly erect involucre occupying the same position with regard to the capsules as that of a true *Asplenium:* the back of the frond is densely clothed with pointed overlapping scales.

Observation. — This genus has long been noticed as distinct, but I have seen no description in which the characters are correctly given. The venation, as well as the position and direction of the capsules, are shown at p. 301. A new name seemed needful; the names of *Scolopendrium*, *Grammitis* and *Gymnogramma*, successively employed, have been severally restricted to very different genera, and that of *Ceterach* seems objectionable as belonging of right to the species.

1. No. Ceterach, fig. p. 293 (as Ceterach officinarum). Asplenium Ceterach, *Linneus*, Sp. Pl. 1538. Scolopendrium Ceterach, Sm. Eng. Flor. iv. 302. Ceterach officinarum, Bab. Man. 389. Hook. Br. Fl. 436.

Genus Phyllitis. Lateral veins twice or thrice bifurcate, free at the extremity, capsules in linear series upon the anterior and posterior branches, on the anterior directed towards the apex of the frond, on posterior towards its base, always in pairs, *i. e.*, when the anterior branch of a lateral vein bears a line of capsules the posterior branch on the lateral vein next before it also bears a line of capsules corresponding in length, and the two lines or series form a confluent mass of capsules covered by two involucres which face each other, and even in an early stage of growth overlap and *appear* united.

Observation. — The name *Phyllitis* was employed by Ray and other eminent botanists of the ante-Linnean era, but I be-

lieve has not been used as generic since the introduction of the binominal nomenclature. I consider that the name of *Scolopendrium* should be confined, as intended by its author, to the species. The genus is generally acknowledged as distinct.

1. Ph. Scolopendrium fig. p. 289 (as Scolopendrium vulgare). Asplenium S. *Linneus*, Sp. Pl. 1537. Scolopendrium vulgare, Sm. Eng. Fl. iv. 301. Hook. Br. Fl. 443. Bab. Man. 389.

Genus Amesium. Ultimate divisions *without* a distinct midvein. The species comprised in this genus were separated by Roth from the other *Asplenia*, and united with my *Phyllitis Scolopendrium* under the generic name of *Scolopendrium*, but they do not possess the singular mode of fructification observable in that genus.

1. Am. septentrionale, fig. p. 269 (as *Asplenium septentrionale*). Acrostichum s. *Linneus*, Sp. Pl. 1524. Asplenium s. Brit. aut.

†2. Am. germanicum, fig. p. 265 (as Asplenium germanicum). Asplenium g. *Weiss*, Plantæ Cryptogamicæ, p. 299, date 1770. Asplenium alternifolium, *Wulfen* in Jacquin's Miscellany, ii. 51, date 1781. Sm. Eng. Fl. iv. 296. Hook. Br. Fl. 442. Bab. Man. 389.

3. Am. Ruta-muraria, fig. p. 261 (as Asplenium Ruta-muraria). Aspl. R.-m. Linn. Sp. Pl. 1541, and Brit. aut.

Genus Asplenium, *Linneus*. Ultimate divisions generally distinct and leaf-like, each *with* a distinct midvein; lateral veins alternate branched; clusters of capsules on anterior branch, their direction towards apex of division; involucre flat its attachment straight, its opening towards the apex of division.

** Fronds simply pinnate.*

1. As. Trichomanes, fig. p. 285. *Linneus*, Sp. Pl. 1540, and Brit. aut.
2. As. viride, fig. p. 281. *Hudson*, Flora Anglica, 385, 1st edit. date 1762, and Brit. aut.
3. As. marinum, fig. p. 275. *Linneus*, Sp. Pl. 1540, and Brit. aut.

*** Pinnæ divided.*

4. As. Adiantum-nigrum, fig. p. 255, var. acutum, p. 257, var. obtusum, p. 257. *Linneus*, Sp. Pl. 1541, and Brit. aut.
5. As. lanceolatum, fig. p. 249. *Hudson*, Flor. Ang. ii. 454, 2nd edit. date 1778, and Brit. aut.

Genus Athyrium, *Roth.* Ultimate divisions generally distinct and leaf-like, each with a distinct midvein: lateral veins always branched: involucre crescent-shaped, its free margin split into capillary segments.

1. At. Filix-femina, fig. p. 238. Polypodium F.-f. *Linneus*, Sp. Pl. 1551. Aspidium F.-f. Sm. Eng. Fl. iv. 282. Asplenium F.-f. Hook. Br. Fl. 443. Athyrium F.-f. Bab. Man. 388.

†2. At. convexum, fig. p. 245. Athyrium F.-f. var. convexum, Bab. Man. 388.

†3. At. molle, fig. p. 245. Polypodium m. *Schreber*, Spic. Flor. Lips. p. 70, date 1771.

Family. — Polypodeæ. Polypodies.

A large and varied group. The capsules are seated in *circular* clusters directly on the *back* of the lateral veins.

Genus Polystichum, *Roth.* Involucre circular attached by its centre. This genus includes all the species I have placed in *Lastræa*: it was first restricted by Schott to the congeners of Roth's typical species *Lonchitis.*

†1. Po. angulare, fig. p. 173. Aspidium a. *Willdenow*, Sp. Pl. v. 257, date 1810. Sm. Eng. Fl. iv. 278. Hook. Br. Fl. 438. Polystichum aculeatum var. Bab. Man. 386.

2. Po. aculeatum, fig. p. 169. Polypodium a. *Linneus*, Sp. Pl. 1552. Aspidium lobatum, Sm. Eng. Fl. iv. 277. Hook. Br. Fl. 438. Polystichum aculeatum, Bab. Man. 386.

3. Po. Lonchitis, fig. p. 163. Polypodium L. *Linneus*, Sp. Pl. 1548. Aspidium L. Sm. Eng. Fl. iv. 271. Hook. Br. Fl. 438. Polystichum L. Bab. Man. 387.

Genus Lastræa, *Bory.* Involucre irregularly reniform sometimes wanting, attached at the marginal notch.

** Clusters of Capsules on anterior branch of lateral veins.*

1. L. recurva, fig. p. 225. Naturalists' Almanack, 23, date 1844.
2. L. multiflora, fig. p. 215, var. nana, p. 222, var. collina, p. 223. Polypodium m. *Roth*, Catalecta Botanica, fasc. 1, p. 135, date 1797. Aspidium dilatatum, spinulosum and dumetorum, Sm. Eng. Fl. iv. 279. Aspidium spinulosum, Hook. Br. Fl. 440. Lastræa dilatata, Bab. Man. 386.
3. L. spinosa, fig. p. 209. Polystichum s. *Roth*, Fl. Germ. iii. 91, date 1800. Lastræa dilatata β. linearis, Bab. Man. 386, omitting the synonyme, "*A. spinulosum*, Sm." which belongs to the preceding species.
4. L. Callipteris, fig. p. 203 (as Lastræa cristata). Polypodium C. *Ehrhart*, Beitrage, iii. 77, date 1788. Aspidium cristatum, Sm. Eng. Fl. iv. 276. Hook. Br. Fl. 439. Lastræa cristata, Bab. Man. 385. This and the preceding constitute the Polypodium cristatum of Linneus, Sp. Pl. 1551. Ehrhart was the first to separate the two species, and his name is adopted by the best authorities.
5. La. Filix-mas, fig. p. 197. Polypodium F.-m. *Linneus*, Sp. Pl. 1551. Aspidium F.-m. Sm. Eng. Fl. iv. 275. Hook. Br. Fl. 440. Lastræa F.-m. Bab. Man. 385.
6. La. rigida, fig. p. 191. Polypodium r. *Hoffmann*, Deutschlands Flora, ii. 16, date 1795. Aspidium r. Hook. Br. Fl. 440. Bab. Man. 386.

*** Clusters of Capsules on either branch of lateral veins. Involucre indistinct often wanting.*

7. La. Thelypteris, fig. p. 183. Acrostichum T. *Linneus*, Sp. Pl. 1528. Aspidium T. Sm. Eng. Fl. iv. 272. Hook. Br. Fl. 439. Lastræa Thelypteris, Bab. Man. 385.
8. La. Oreopteris, fig. p. 187. Polypodium O. (*Ehrhart*) Dickson, Trans. Linn. Soc. i. 181, date 1791. Aspidium O. Sm. Eng. Fl. iv. 273. Hook. Br. Fl. 439. Lastræa O. Bab. Man. 385. The earliest name for this species appears to be *Polypodium montanum*, given it by Vogler, 1781, but that name was discontinued as interfering with the *Polypodium montanum* of Allioni,—the *Cystopteris montana* of this work.

9. La. Phegopteris, fig. p. 115 (as Polypodium Phegopteris). Polypodium P. *Linneus*, Sp. Pl. 1550, and Brit. aut.
10. La. robertiana, fig. p. 131 (as Polypodium calcareum). Polypodium r. *Hoffmann*, Deutsch. Flora, ii. addendum to p. 10, date 1795. "23. *Polypodium robertianum* fronde triangulari, foliolis ternis bipinnatis: pinnis pinnulisque inferne pinnatifidis. In montosis rupestribus. Jun. (Gott.— Polypod. Dryopt. simile. Stipes glaucus uno latere sulcatus. Frons tenera. Uterque nudo oculo subtili tomento, ad lentem brevissimis glandulis obsitus. Odor debilis Geran. robert. Fructif. minuta)." Hoff. l. c. This description is so admirably applicable to the present species, that one is at a loss to conceive how it can have been overlooked. Polypodium calcareum, Sm. Flora Britannica, 1117, and Brit. aut.
11. La. Dryopteris, fig. p. 123 (as Polypodium Dryopteris). Polypodium D. *Linneus*, Sp. Pl. 1555, and Brit. aut.

Genus Cystopteris, *Bernhardi.* Midvein of ultimate divisions distinct, lateral veins branched free: involucre attached half way between midvein and extremity, projecting forwards and covering the circular mass of young capsules like a hood, its anterior margin split into unequal and often capillary segments.

1. Cy. montana, fig. p. 159. Polypodium m. *Allioni*, Pedemont. n. 2410, date 1785.
2. Cy. fragilis, fig. pp. 149, 154, 155, 156, 157. Polypodium f. *Linneus*, Sp. Pl. 1553. Cystea fragilis, dentata, angustata and regia, Sm. Eng. Fl. iv. 285. Cistopteris fragilis, dentata and alpina, Hook. Br. Fl. 441. Cystopteris fragilis, Bab. Man. 387.

Genus Woodsia, *R. Brown.* Midvein of ultimate divisions indistinct, lateral veins branched free: involucre seated near the extremity of each branch, its base enclosing the base of capsules its margin split into jointed capillary segments which mingle with the capsules.

1. Wo. Ilvensis, fig. p. 137, supposed to be the Acrostichum Ilvense of *Linneus*, Sp. Pl. 1528. Woodsia Ilvensis of Brit. aut.
2. Wo. alpina, fig. p. 143. Acrostichum a. *Bolton*, Filices,

p. 76, tab. 42, 1790. Acrostichum hyperboreum, Liljeblad, Stockholm Trans. for 1793. Woodsia h. Sm. Eng. Fl. iv. 310. Hook. Br. Fl. 437. Woodsia ilvensis, var. Bab. Man. 384.

Genus Allosorus, *Bernhardi.* Midvein distinct, lateral veins free: involucre not apparent: capsules near the extremity of lateral veins which are often divided, epidermis bleached reflexed covering the capsules as in *Pteris.*

1. All. crispus, fig. p. 103. Osmunda c. *Linneus,* Sp. Pl. 1522. Pteris c. Sm. Eng. Fl. iv. 306. Cryptogramma c. Hook. Br. Fl. 444. Allosorus c. Bab. Man. 383.

Genus Polypodium, *Linneus.* Midvein very distinct, lateral veins branched, branches free terminating in a small club, the anterior branch bearing at its extremity a large circular cluster of capsules which has no visible involucre.

1. Po. vulgare, fig. p. 111. *Linneus,* Sp. Pl. 1544, and Brit. aut.

Family. — Hymenophylleæ. Filmy Ferns.

Fronds appearing to consist of branched veins, each accompanied throughout by a membranaceous wing or margin: cluster of capsules nearly spherical seated on one of these veins which projects beyond the edge of the leaf, the cluster being enclosed in a kind of cup-like involucre.

Genus Trichomanes, *Linneus.* Involucre elongate somewhat urn-shaped, capsuliferous vein projecting beyond it in the form of a long stiff bristle.

1. Tr. speciosum, fig. p. 305. *Willdenow,* Sp. Pl. v. 514, date 1810. Bab. Man. 390. Tr. brevisetum, Sm. Eng. Fl. iv. 311. Hook. Br. Fl. 445.

†2. Tr. Andrewsii, fig. p. 315 (as Tr. s. var. Andrewsii): probably a species.

Genus Hymenophyllum, *Smith.* The involucre is shorter and rounder than in the preceding genus, the receptacle or capsuliferous vein not longer than the involucre.

1. Hy. tunbridgense, fig. p. 321. Trichomanes t. *Linneus,* Sp. Pl. 1561. Hymenophyllum t. of Brit. aut.

†2. Hy. unilaterale, fig. p. 325 (as Hymenophyllum Wilsoni).

Willdenow, Sp. Pl. v. 521, date 1810. Hy. Wilsoni, Hook. Br. Fl. 446. Bab. Man. 391.

Order III.— OSMUNDACEÆ.

Very like the *Filicaceæ* in appearance and in their circinate vernation. The capsules occupy the upper portion of the frond in crowded circular clusters, and form a dense panicle; the capsules are without the elastic ring; the stalk of the frond is hard and woody.

Genus Osmunda, *Linneus*. The characters those of the order.

1. Os. regalis, fig. p. 331 of panicle only, p. 333 of entire frond. *Linneus*, Sp. Pl. 1521, and Brit. aut.

Order IV. — OPHIOGLOSSACEÆ.

Roots very succulent and comparatively stout. Stem succulent, not woody; vernation straight; frond composed of two branches, the outer leafy, the inner entirely capsuliferous: capsules large, splitting transversely, totally without either the elastic ring or involucre.

Genus Botrychium, *Swartz*. Young frond produced within the base of the old one, fertile branch of frond much divided, barren also divided.

1. Bo. lunaria, fig. p. 337. Osmunda l. *Linneus*, Sp. Pl. 1519. Botrychium l. of Brit. aut.

Genus Ophioglossum, *Linneus*. Young frond produced exterior to the base of old one; fertile branch a simple erect stalked pointed spike, barren branch simple undivided.

1. O. vulgatum, fig. p. 349. *Linneus*, Sp. Pl. 1518, and Brit. aut.

Order V. — LYCOPODIACEÆ.

Evergreen cryptogamous plants: the capsules sessile at the base of the leaves.

Family.—Lycopodeæ. Club Mosses.

Having a tough persistent stem beset with short hard leaves;

capsules sessile in the axils of the leaves. Plants resembling mosses.

Genus Lycopodium, *Linneus*. The characters those of the family.

1. Ly. clavatum, fig. p. 353. *Linneus*, Sp. Pl. 1564, and Brit. aut.
2. Ly. annotinum, fig. p. 361. *Linneus*, Sp. Pl. 1566, and Brit. aut.
3. Ly. alpinum, fig. p. 365. *Linneus*, Sp. Pl. 1567, and Brit. aut.
4. Ly. inundatum, fig. p. 369. *Linneus*, Sp. Pl. 1565, and Brit. aut.
5. Ly. selaginoides, fig. p. 371. *Linneus*, Sp. Pl. 1565, and Brit. aut.
6. Ly. Selago, fig. p. 375. *Linneus*, Sp. Pl. 1565, and Brit. aut.

Family.—Isoeteæ. Quillworts.

Fronds hollow, longitudinally quadripartite, sessile on a tuberous rhizoma: capsules large, seated within the substance of the leaf at its base. Subaquatic plants.

Genus Isoetes, *Linneus*. The characters of which are those of the family.

1. Is. lacustris, fig. p. 381. *Linneus*, Sp. Pl. 1563, and Brit. aut.

Order V.—MARSILEACEÆ.

Aquatic plants with circinate vernation and having stalked capsules attached to a creeping rhizoma.

Genus Pilularia, *Linneus*. Fronds threadlike, capsules densely clothed with a hairy investment.

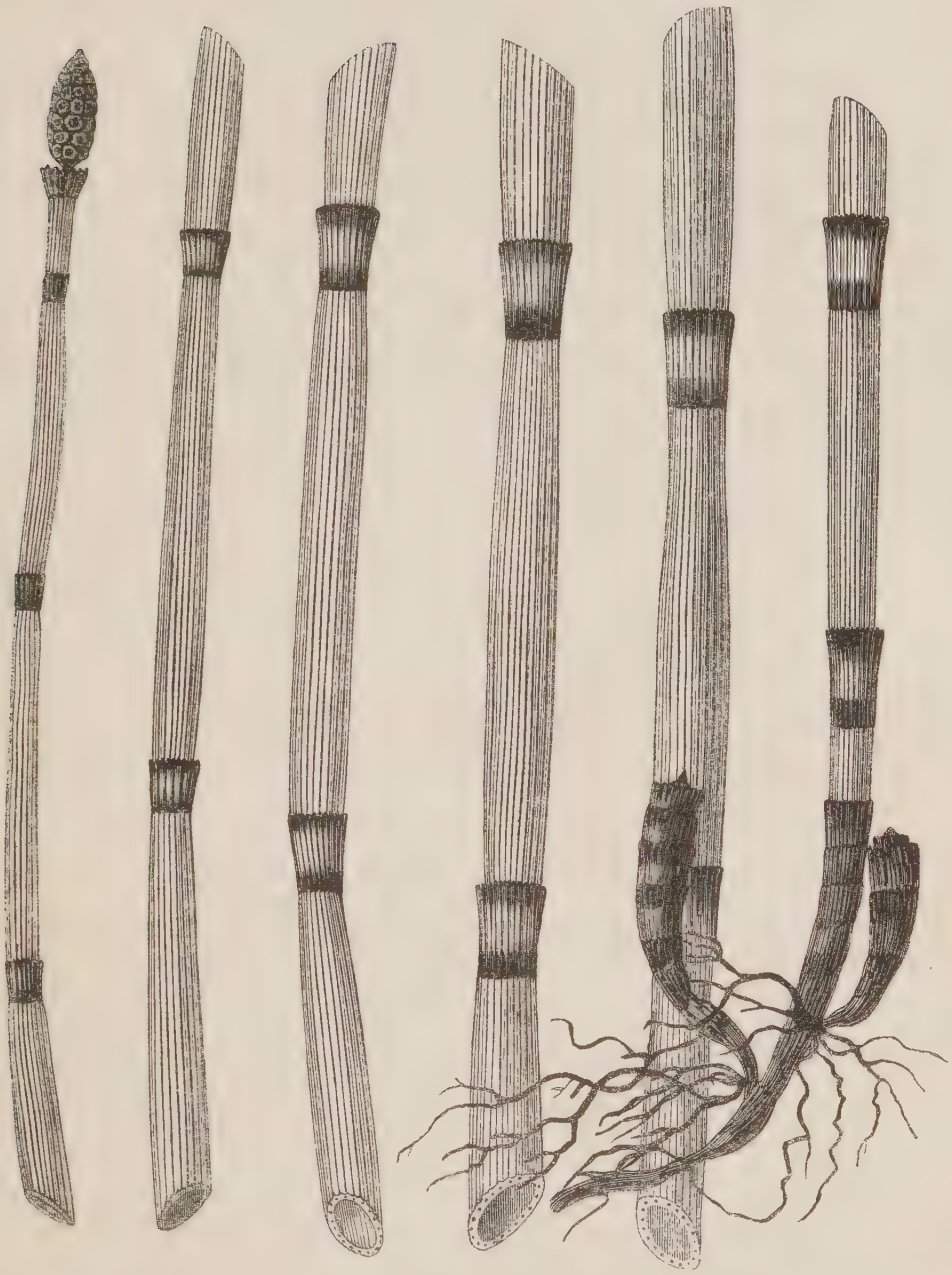
1. Pi. globulifera, fig. p. 393. *Linneus*, Sp. Pl. 1563, and Brit. aut.

By the reference 'British authors' or 'Brit. aut.' I allude to the latest edition of each of the undermentioned works.

The English Flora. By Sir J. E. Smith. 2nd ed. dated 1830.

The British Flora. By Sir W. J. Hooker. 5th ed. dated 1842.

Manual of British Botany. By C. C. Babington. 1st ed. dated 1843.



ROUGH EQUISETUM, OR DUTCH RUSH, (*natural size*).

EQUISETUM HYEMALE, Linneus.

THIS plant appears to be almost unknown in the midland and southern English counties. Indeed, throughout the kingdom it is but sparingly distributed, and may be considered a strictly local plant. In Turner and Dillwyn's 'Botanist's Guide,' the following English habitats are recorded:—in Northumberland, Scott's wood, wood below Mill green, and Heaton wood; in Cumberland, Lowgelt-bridge; in Durham, woods about Derwent-bridge

and Castle Eden-Dean; in Yorkshire, woods at Castle Howard and Kirkham, Rigby woods near Pontefract, near Ingleton and Halifax, about Leeds, Hackfall, near Huby, Laver banks and Mackershaw wood, on the banks of the Skell by Ripon; in Cheshire, near Arden-Hall, in a wood close to the river; in Norfolk, St. Faith's bog and Arming-Hall wood, near Norwich; in Nottinghamshire, about the middle of Nettleworth green, two miles from Mansfield, plentifully among the rushes; in Warwickshire, in a moist ditch near Middleton; in Cambridgeshire, Stretham ferry and Gamlingay bogs; in Bedfordshire, Potton marshes and Ampthill bogs: in Wiltshire, in a rivulet near Broadstitch Abbey, plentifully. The same authors have recorded two Welch habitats: — in Denbighshire, on the west side of the brook that runs from Henllan mill into the river Elwy, about 300 yards from Trap bridge, less than a mile from Garm; and in Flintshire, near Maesmynnan. In addition to these localities, I am enabled, through the kindness of correspondents, to give the following:—in Yorkshire, "by the Derwent at Crambeck, and near Raskelf, J. Backhouse, jun.," "Bolton woods in Wharfedale, S. Gibson," and "by the banks of a rivulet in Conesthorpe, H. Ibbotson;" Lancashire, "in small quantities, in Mereclough, near Manchester, J. B. Wood;" Cheshire, "Lally's wood, near Over, W. Wilson;" Worcestershire, "Mosley Bog, G. W. Perry;" and Leicestershire, "Gracedieu, C. Babington."

Through the liberality of Dr. Greville, Dr. Balfour and Dr. Campbell, I have received specimens from several Scotch habitats, more particularly the vicinity of Edinburgh; Mr. Brichan has obligingly sent me specimens from the banks of the Dee, Kincardineshire; Mr. Kippist informs me that he has seen it in abundance in the woods about Corra Lyn, Lanarkshire; and the Rev. G. Gordon mentions it as very abundant in the bog at Pittendriech, in Moray. In Ireland, Mr. Mackay and Mr. Moore have found it in the counties Dublin and Wicklow.

The figures usually quoted as representing this plant are so incorrect that they can only be referred to with doubt. Tragus* and Dalechamp,† whose figures are usually supposed to be in-

* Tragus, Hieron, 692. † Dalechamp, Historia, i. 1071.

tended for representations of *Equisetum hyemale*, have adorned the upper part of each stem with whorls of short branches, which give the plant a very extraordinary appearance, and suggest the idea of their being intended for *Equisetum fluviatile* or *Hippuris vulgaris*, the upper part of the stems much resembling the latter plant; and it may be added that Tragus assigns to his figure the name of *Hippuris*. It should however be observed that one of these figures is a servile copy from the other, the outline having been traced and transferred to another block, by which the figure has been reversed. The figure in Matthiolus,* also supposed to refer to this species, may possibly be intended for the *E. variegatum* of this work; but I can only venture this as a suggestion, for it is by no means characteristic of any plant with which I am acquainted. Gerarde's figure† evidently represents *variegatum*, the specimen selected for the purpose being more than usually divided: the learned author however ascribes to his plant the property usually assigned exclusively to the present species, speaking of it as the "small and naked shave-grasse wherewith Fletchers and Combemakers doe rub and polish their work."‡ Camerarius§ also represents *variegatum*. The figure in 'English Botany' ‖ appears to me to be spoiled by an attempt to represent the roughness of the stem, which of course cannot be accomplished. That in the 'Flora Londinensis' ¶ is the most characteristic I have met with.

The medicinal and other properties of this Equisetum have been amply recorded by the earlier herbalists, but most of them appear to quote Galen as their authority. In consequence of the confused nomenclature and very indifferent figures of these authors, the properties alluded to become very doubtful as intended for the present species; and even were they so intended, all faith in them, as far as regards medicine, has long been exploded. Tragus tells us that it is most useful as a medicine, taken internally or externally; internally its properties are somewhat astringent: the expressed juice put into the nostrils and applied at the same time on the neck, stops bleeding at the

* Matt. Valg. ii. 375. † Ger. Em. 1113. ‡ Ger. Em. l. c.
§ Camer. Epit. 772. ‖ Eng. Bot. 915. ¶ Fl. Lond. 161.

nose; and the bruised plant laid on a recent wound staunches the blood.*

We are told by Lightfoot † that "some entertain an opinion that if cows chance to feed upon" this Equisetum "their teeth will drop out: how far this may be true," he adds, "I know not, but I am persuaded that the pasture must be very bad where they are compelled to eat such food." Sir William Hooker appears to give the plant credit for this injurious quality: he says "that though while to sheep it proves injurious, and that the teeth of cows who eat it soon fall out, it is wholesome for horses."‡

The stems of this plant have for centuries been used by artificers in smoothing the surface of wood, bone, and even metal, previously to giving these substances their final polish. This employment of the stem was noticed by Gerarde in the passage already quoted. Haller § also mentions it as being in his day used, in common with other species of Equisetum, to polish metal vessels, but speaks of this species as being the roughest

* Vires ac temperamentum.

Hippuris ea quæ capillamento potius quam folio articulatur, magni in medicina et maxime probandi est usus, propter miram sanandi vim quam obtinet spissandi facultate prædita et utrisque corporis partibus utillissima.

Intrinsecus.

Hippuris cujus jam meminimus, sistendi sanguinem mira facultate pollet. Succus namque ejus bibitus profluvia sanguinis * * * * cohibet. * * Eadem potest aqua stillatitia per diem bis aut ter mensura trium cochlearium sumpta. Succus in vino potus tormina ventris sedat, tussim, orthopnæum, ruptaque adjuvat necnon dissectiones vesicæ et intestinorum enterocelasque.

Ad eadem herba vino decocta et calida pota facit. Potest vero vel herba vel radix, vino aquave ad omnes istas affectiones decoqui, pro ratione morbi.

Extrinsecus.

Succus herbe expressus naribusque inditus et cervici simul impositus sanguinem e naribus erumpentem sistit. Idem aqua stillatitia efficit.

Herba tusa ac cum succo suo imposita cruorem e vulneribus manantem supprimit ipsaque intra paucos dies glutinat teste Galeno qui Hippurim ad sanguinis rejectionem * * ad dysenterias et ad alia ventris profluvia generosum esse medicamentum asserit.—Tragus l. c.

† Lightfoot, Flora Scotica, 650. ‡ Flora Londinensis, 161.

§ Omnia Equiseta ad polienda vasa metallica adhibentur. Hoc tamen ut omnium asperrimum ita aurifabris et scriniariis suos ad usus optissimum est. —Hall. Hist. iii. 3.

and best. We are further told by Lightfoot that "in Northumberland the dairy-maids scour their milk-pails with it." The value of this plant for the purpose of smoothing or polishing is not, however, merely traditionary, nor, like its medicinal virtues, imaginary: it is still used for polishing wood, bone, ivory, and various metals, particularly brass; for this purpose it is imported, under the name of "Dutch Rush," in large quantities, from Holland, where it is grown on the banks of canals and on the sea ramparts, which are often bound together and consolidated by its strong and matted roots. Bundles of this imported Dutch Rush are exposed for sale by many London shopkeepers. They may be seen at Mr. Woodward's, Old Compton St., corner of Frith St., Soho. I find however that a doubt exists with some excellent botanists, as to whether the Dutch Rush cultivated in Holland is identical with either of our British species. Mr. Shepherd, the curator of the Liverpool Botanic Garden, having this plant in cultivation, has most kindly supplied me with specimens in a recent state. These are of much larger size than any British examples of *E. hyemale* I have yet seen, and present structural characters different from those of either of the British plants. The most obvious difference is the much greater number of striæ, amounting in some instances to thirty-two.

The roots are strong, black and frequently divided; the rhizoma or underground stem is creeping, jointed, branched, and with age extends to a great length: at the joints it is solid, but between them it is partially hollow, the interior being occasionally more or less divided by longitudinal septa. The stems are generally erect and simple; when divided, the branch is lateral, and issues from the main stem immediately below the base of one of the sheaths; a stem has rarely more than a single branch: the annexed figure represents a branched specimen, for which I am indebted to Dr. Greville; it is from Roslin woods, near Edinburgh.

The engraving at page 17 is intended to represent, of the natural size, a stem of fine but not extraordinary growth. The

stem has been divided into six portions, in order to exhibit the whole at a single view; its diameter and length, together with the distances between the sheaths, have been faithfully copied. The sheaths in the specimen figured are fourteen in number, the internodes decreasing in length towards either end. Both the internodes and sheaths are striated, the former more strongly so: the striæ are usually about twenty in luxuriant stems, but this number is liable to considerable variation, and appears to depend entirely on the size of the stem, always decreasing towards its attenuated apex. The stems are hollow, and jointed or divided by a strong transverse septum at each of the sheaths: the striæ of the sheaths correspond in number with those of the internodes, and they terminate in an equal number of acute and elongate, but membranous and deciduous teeth. Under certain but unascertained conditions these teeth become setiform and persistent, but in general all trace of them is early lost, the upper margin of the sheath exhibiting a regular series of rounded divisions, uniform in number with the striæ of the stem. The sheath of the catkin is, however, an exception, its teeth being invariably persistent when mature: the basal portion of each sheath is black, the central part whitish, and the upper part again black, but all the sheaths are at first greyish-green, afterwards entirely black, and finally of two colours as described.

Sir Humphrey Davy detected in the stem of this plant an extraordinary quantity of silex; it is this substance that communicates to the stem the rough and file-like character from which it derives its value as an article of commerce. The silex appears in the form of minute crystals, arranged with beautiful and perfect regularity. Under the microscope we find these crystals forming longitudinal series of elevations on the stem: in the furrows between these are numerous cup-shaped depressions, at the bottom of each of which is placed a stoma. In the volume on Optics in Lardner's 'Cabinet Cyclopedia,' Dr. Brewster has recorded that he found each particle of silex to possess an axis of double refraction. We are told by botanists that the quantity of silex is so great, and the particles so closely set, that the whole of the vegetable matter may be removed by maceration without destroying the form of the plant.

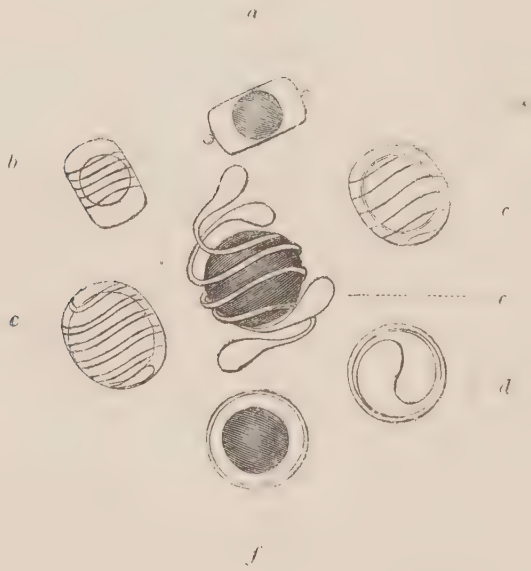
The catkin is small, dark coloured, apiculate and terminal, or rarely lateral, and then very near the apex; its scales are from forty to fifty in number, and each is impressed with two or three vertical striæ. Before the scales have separated in their approach to maturity, these striæ are continuous throughout the catkin, even entering its terminal apiculus, which, in consequence, assumes a polyhedral figure: they generally correspond in number with the striæ of the last internode, thus leading to the supposition that the catkin is a metamorphosed portion of the stem.

Mr. Brichan* has noticed the occasional presence of a singular pile of cones on the stems of this species; I will describe it in his own words. — "On the top of many stems of *E. hyemale* I observed a pile of small, dark brown, membranous, elastic, conical, inverted sheaths, of the same substance as the teeth of the sheath which embraces the catkin, increasing in width upwards, and so closely embracing each other that the rim only of each is seen, except the highest and largest, which gives the top of the pile a conical shape. Although scarcely an inch in length, it resembles an *inverted abortion* of the plant. Its lower end is at first inserted in the uppermost sheath, and surrounded by several small sheaths of a texture similar to its own, and placed within each other. It is afterwards quite protruded, and gradually falls off, leaving a flexuous apex, somewhat like that of the catkin, whose formation I am persuaded it precedes. On dissecting the top of several stems from which the pile of cones seemed but recently to have fallen, I found the germ of the catkin completely enclosed within its sheath, the teeth of which, not yet separate, form by their union the apex which appears when the pile falls off. Dissection, however, when the cones are present, seems often to discover an *abortive* germ. The number of inverted sheaths in one of these piles is about twelve; what their peculiar function may be I cannot even conjecture."

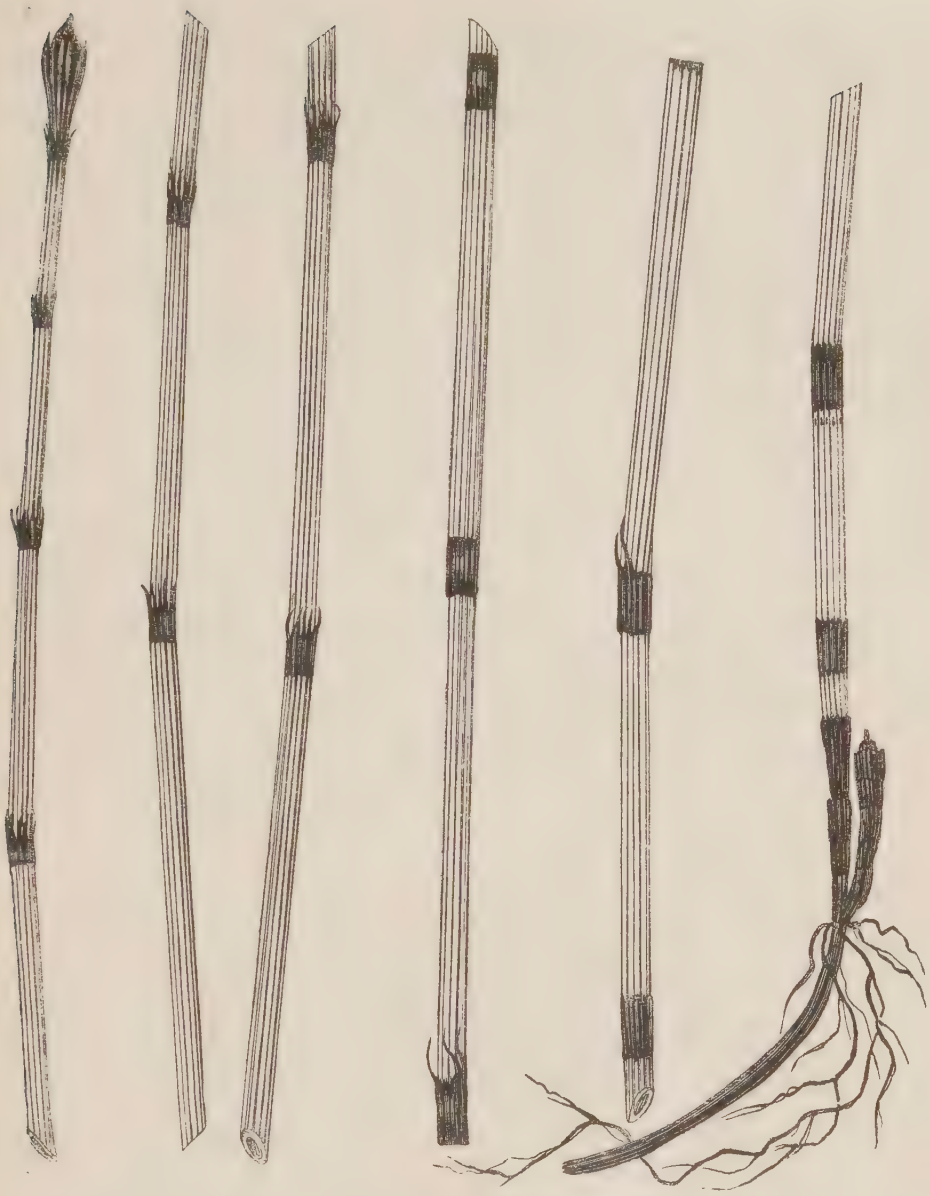
The spores or supposed seeds of Equisetums have long been favorite objects with the microscopist. The figures given below represent the spores of the present species in various stages of development: they are copied from the illustrations to a paper

* Phytologist, 374.

'On the Reproductive Organs of Equisetum, by Mr. Joseph Henderson,' published in the Linnean Transactions.* Fig. *a* represents a detached spore, with its investing cell or integument; the little appendage at either end is supposed to be the remains of what connected it with contiguous cells when lying in the theca at an earlier stage: *b* shows the indistinct commencement of the sutures of the integument, which subsequently separates at these sutures: *c c*, the same still further advanced, exhibiting all the sutures of the integument: *d* is an end view, showing the dilated extremities of the two linear portions, into which the integument is about to divide; the central figure (*e*) exhibits the spiral linear divisions of the integument after separation; *f* the spore with its outer tunic, after immersion in dilute tincture of iodine.—These purely microscopic parts are most probably unavailable as affording characters for discriminating species; I have introduced them merely to give an idea of the inexhaustible fund of instruction contained in every part of these interesting plants.



* Transactions of the Linnean Society of London, vol. xviii. p. 567, pl. 39.



† MACKAY'S EQUISETUM, (*natural size*).

Equisetum Mackaii, Newman.

Equisetum elongatum, Hooker.

This plant occurs in the North of Ireland, more particularly in the counties Derry and Antrim. Since the publication of this species in 'The Phytologist,' Dr. Scouler has informed me that it was first found by Mr. Whitla in Colin Glen, near Belfast, and afterwards in the Deer-park near Glenarm, and was recognized by that gentleman as a distinct species; but Mr. Mackay, alluding to this discovery in his 'Flora Hibernica,' writes thus.

" Moist banks near a waterfall, at the upper end of Colin Glen, Belfast, where I found it, in company with Mr. F. Whitla, in August, 1833." I gave the substance of this statement in 'The Phytologist,'* and named the plant in honor of Mr. Mackay; supposing him the original discoverer of the plant, I thought it a compliment justly due to so distinguished a botanist. Since its first discovery it has been found by Mr. Moore in many of the glens in the North of Ireland, particularly in Ballyharrigan glen (Derry), and in the wild deep ravines emphatically called " The Glens " (Antrim). In Scotland it was first discovered in 1841, on the banks and " in what is usually the bed of the river " Dee, in Aberdeenshire, by Mr. Brichan; and I have to acknowledge the great obligation I am under, both to Mr. Moore and Mr. Brichan, for a supply of specimens, recent and dried, so that I have had the best possible opportunity for a careful investigation and comparison of the plants from the Scotch and Irish localities, and have no hesitation in pronouncing them identical; an opinion in which I believe all botanists who have compared them fully concur.

Its discovery caused a multiplicity of correspondence among botanists, some maintaining that it was merely an elongate and exuberant form of *Equisetum variegatum;* others that it was a good species, perfectly distinct from any which had been previously recorded as British. The matter rested thus until the question was referred to Sir W. J. Hooker, and that illustrious botanist decided not only in favor of its distinctness as a species, but pronounced it to be the *Equisetum elongatum* of Willdenow, (see 'London Journal of Botany,' 42, and Phytol. 174). Feeling as I do the difficulty under which I shall labour in venturing to differ from so high an authority as Sir William Hooker, I must still record my opinion that the plant before me is not identical with the *Equis. elongatum* of Willdenow† and

* Phytologist, 306.

† Equisetum elongatum, W. E. caulibus subduplicato-ramosis, ramis subternis scabriusculis sexsulcatis, dentibus vaginarum membranaceis, W.

E. (*ramosissimum*), caule striato ramosissimo, ramis virgatis striatis erectis verticillatis, apice floriferis. Desf. Atl. ii. p. 398?

Caulis tripedalis et altior quasi scandens, subduplicato ramosus, profundè

Reichenbach,* the essential characters of which appear to be that it has *verticillate* and 6-*angled* branches, and that the sheaths are *hoary green*, concolorous with the internodes: I have faithfully transcribed both the descriptions in question. Moreover, on consulting Professor Vaucher's 'Monographie des Prêles,' published in the first volume of the 'Mémoires de la Société de Physique, etc. de Genève,' I find that learned author has not only described at length but figured (Pl. VI.) Willdenow's plant under Desfontaine's prior name of *Equisetum ramosissimum:* the subduplicato-ramose stem and verticillate character of the branches, as well as the concolorous sheaths, are well represented. Vaucher gives the appropriate name of *Equisetum multiforme* to a species which appears to include the *variegatum* of Schleicher's Catalogue and various other forms; among these the present plant is not distinctly characterized: his β. *Equisetum multiforme ramosum*, which, in other respects, comes the nearest, having the sheaths differently coloured. His description of this variety is quoted below.†

striatus, scabriusculus. Rami terni, superiores simplices semipedales usque ferè pedales, inferiores iterum ramosi, ramulis subopposítis sexsulcatis. Vaginæ concolores dentatæ, dentibus albis, diaphanis, aristatis, aristis caducis. Ab omnibus mihi cognitis abundè diversum. Equisetum ramosissimum Clariss. Desfontaines non differre videtur. Willdenow, Sp. Pl. v. 8.

* E. elongatum, W. caule ramulisque sexangularibus longissimis superioribus spiciferis, spica mucronata, vaginis concoloribus (cano-viridibus), dentibus persistentibus albis vix puncto sphacelatis cartilagineis, in acumen quasi fimbriam longissimam hyalinam flaccidam deciduam productis.

Hyemale, β. procerum Pollin et omnino vix recedere video.

Quadripedale et altius quasi scandens ramuli ultra pedales. Flor. Germ. Excurs. 155.

† β. *Equisetum multiforme ramosum.* Prêle multiforme rameuse. Cette seconde variété est peu connue des Botanistes quoiqu'elle soit assez répandue; elle émet de sa racine plusieurs tiges courtes semblables à celles de la variété *a.* dont les gaînes sont plus ou moins noirâtres; mais on y observe encore une ou plusieurs tiges principales, qui peuvent s'élever jusqu'à trois pieds et qui sont terminées par un épi plus grand que celui de la variété *a.* Les gaînes ont amples, assez lâches, blanches ou brunes, mais rarement noires; les rameaux sont assez nombreux, plus ou moins réguliers, et quelquefois prolifères.

M. Vaucher, in his introductory remarks on the genus, aptly cites his *Equisetum multiforme* as an instance of characteristic liability to variation. After mentioning that the Equiseta generally occur on the banks of streams and in damp places, as well as in the water, he says they are occasionally "even met with in sandy places that are not watery, such is the case with *Equisetum multiforme:* this species appears strongly influenced by the properties of the soil in which it grows, for sometimes it throws out but a small number of slender and short branches, at other times, on the contrary, and especially when in a more fertile soil, we find issuing from the principal stem, branches not only much longer but much more divided, so much so indeed that it has been thought it could not then be referred to the same species."*

The roots and rhizoma present no characters by which I can distinguish this plant from that previously described: in both, these parts are black, the roots being tortuous, much divided, and often clothed with minute and matted fibrillæ: the stems are very long, generally erect, nearly straight, and jointed as in the former species: the figure at p. 25, shows a stem divided into six portions, its size and the relative length of the internodes having been copied with scrupulous accuracy. Both the internodes and sheaths are striated; the striæ vary in number from eight to twelve, or even fourteen. The stem is hollow, with the

Cette variété β. se trouve souvent réunie á la première, et l'on peut facilement observer des échantillons qui présentent toutes les nuances intermédiaires. Ordinairement la Prêle rameuse se rencontre dans des terreins plus riches et plus favorables à la végétation.—'Mémoires de la Société de Physique et d'Histoire Naturelle de Genève.' i. 379. The plant is the *Equisetum ramosum* of Schkuhr, p. 178, tab. 172, *b*.

* On en rencontre même dans les terreins sablonneux et non humectés, comme par exemple la Prêle multiforme; mais cette dernière espèce paroît être fortement influencée par la nature du terrein dans lequel elle croît, car tantôt elle ne développe qu'un petit nombre de tiges grêles et fort courtes, tantôt au contraire, et surtout lorsqu'elle sort d'un terrein plus riche, on voit sortir de la touffe principale des tiges beaucoup plus grosses et plus ramifiées, qu'on croiroit ne point appartenir à la même espèce.—Id. 333.

exception of the transverse septa occurring at the sheaths. Instead of being uniformly simple, as represented in the figure at page 25, it is very frequently sparingly branched, as shown in the left hand figure in the margin; the branches rise singly from below one of the sheaths, and a stem often bears two or three such branches; the branches themselves also occasionally emit other branches in the same way, the plant, in that case, being very luxuriant, and attaining a height of three to four feet: the right hand figure in the margin is a diagram showing the mode of branching. Under the microscope the structure of the stem appears precisely identical with that of *E. hyemale;* the double row of elevations on each of the ridges, with the cup-shaped depressions and stomata in the furrows, are exactly as I have already described them. The sheaths are generally black, the central part sometimes white, but scarcely ever so distinctly banded as in *E. hyemale:* the teeth are very long, flexuous and setiform; their edges at the base are dilated, membranous, somewhat whitish, and nearly transparent; they are usually, but not invariably, persistent. The catkin is small, nearly black, apiculate, terminal, and striated as in the preceding species: the scales are about thirty in number.

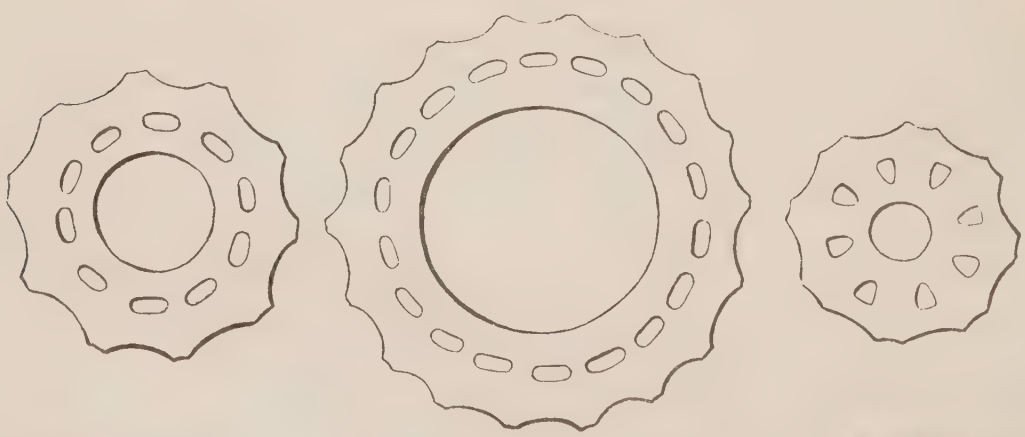
In my history of the British Equiseta published in 'The Phytologist,' I have treated this and the two following species as varieties of *E. hyemale:* abler botanists than myself, and more particularly Mr. Brichan, in an admirable paper in 'The Phytologist,'* have courteously but decidedly expressed their disap-

* See Appendix B.

probation of my views; and I think it well, in a work like the present, to content myself with endeavouring to discriminate between the plants described, without making any other attempt to enforce my views as to the limits of species or varieties, than by recording the doubt which I feel on the subject by prefixing a † to the names of all those species whose distinctness I do not at present consider to be clearly proved.

The stem cut transversely presents a section somewhat different from that of *E. hyemale:* the furrows are wider, and the rows of siliceous particles rather more distant, yet less so than in *E. variegatum.* Magnified sections of all three are given in the vignette below: the central figure represents *E. hyemale*, the right hand figure *E. variegatum*, and the left hand *E. Mackaii.* The sections were cut from specimens of average size, were magnified by the same power, and the outline traced by means of a camera lucida, so that the relative sizes of the three, as well as their proportions, are accurately preserved.

Closely allied to the present species, but still to all appearance distinct, is the *Equisetum ramosum* of Schkuhr—the *E. multiforme ramosum* of Vaucher and Decandolle. It is said by Schkuhr to have been found in Wales, but I do not know on what authority: it is figured and fully described both by Schkuhr and Vaucher, and specimens may be consulted in the herbarium of the late Mr. Winch, now in possession of the Linnean Society of London.



†VARIEGATED EQUISETUM, (*natural size*).

EQUISETUM VARIEGATUM, Smith, Hooker.

THIS, like the preceding species, is local, occurring generally on dry moveable sand in the immediate vicinity of the sea, but sometimes in ditches, canals or rivers, when it assumes a somewhat enlarged and altered appearance.

In England it occurs at the mouth of the Mersey: I have

repeatedly observed it on New Brighton sands on the Cheshire side, and the Bootle sands on the Lancashire side : it is tolerably abundant also at Southport, in the latter county. In Teesdale it has been found in several spots, more particularly at Widdy bank, and about Winch-bridge. In Cumberland it is very tall and luxuriant on the banks of the Irthing, above the upper stepping-stones at Gilsland.

In Scotland it was first found by the late Mr. George Don, in 1807, on the sands of Barry, near Dundee; it occurs also in Rosshire, and in Kincardineshire on the banks and in the bed of the Dee, intermixed with the two species I have already described. In Ireland it is abundant in several sea-coast localities, more particularly at Port Marnock : also in the Dublin canal, in a ditch at Mucruss, &c.

For specimens from these localities, and for much valuable information respecting them, I have to acknowledge my best thanks to Dr. Greville, Dr. Balfour, Mr. Wilson, Mr. Babington, Mr. Gibson, Mr. Brichan, and Mr. Moore of the Dublin Glasnevin garden.

The nomenclature of this species is involved in great, and I fear inextricable, confusion, for although certain plants have frequently been described under the present name, I feel convinced that the same plant, whether it be considered a species or variety, has not always been intended ; moreover, Vaucher and Decandolle combine the varieties of the present plant with *E. ramosum* and *E. campanulatum* (neither of which is yet known to be British) under the single specific name of *E. multiforme*. Under these circumstances I adopt the nomenclature of our British authors, Sir J. E. Smith and Sir W. J. Hooker, a course which I trust will be found convenient until the synonyms shall be unravelled by some abler hand than mine. The name of *variegatum* was, it appears, first employed in Schleicher's Catalogue, but, being unaccompanied by a description, I think we are by no means bound to enquire what plant was intended by the author, more especially as no satisfactory result could possibly be attained. The first description which I find is published in the 'Botanical Pocket-book' for 1807, by Weber and Mohr : this description, representing the plant as erect and as growing

in marshes, I have quoted below.* We next pass on to Willdenow's description,† which also represents the plant as erect: we then arrive at the description of the accurate Wahlenberg, who omits *variegatum* as a species, substituting the name of *reptans*, and describing as the *α.* or normal form a small creeping mountain plant; he gives as his var. *β. variegatum* the erect plant of Weber and Mohr, and of Willdenow, and states that it grows on the banks of a river.‡ Wahlenberg seems to consider his

* *Eq. variegatum.* Stirps gracilis tenella. Caules ex una radice plures, simplicissimi, erecti, nudi, glabri, amentiferi. Articuli longiusculi, sub-8-sulcati. Vaginæ inferne nigricantes, ad dimidium usque fissæ, dentibus lanceolato-subulatis, albidis, carina apiceque nigris, scariosis, suboctonis, vaginæ amentum cingentis maximis. Amentum terminale, parvum, ovatum, nigricans. Receptacula partesque genitales ut in congeneribus. *Obs.* Caulibus simplicissimis, nudissimis, articulorum longitudine, vaginarum colore, amenti denique forma Eq. hyemali proximum, distinctissimum, vaginis omnibus dentatis, cætera ut negligamus. Cum Eq. scirpoidi habitu tenello, colore, amento et articulorum ratione convenit quidem, ast vaginis in nostro multifidis, in illo trisetis ut habet Cel. Michaux l. ejus interpres, toto cælo differt.—' Botanisches Taschenbuch auf das Jahr. 1807. Deutschlands Kryptogamische Gewachse. Friedr. Weber. und D. M. H. Mohr, p. 447.' The following diagnosis and synonymes are given at p. 60 of the same work. *Eq. variegatum*, Schleich. caule nudo; vaginarum dentibus lanceolato-subulatis. Schleich. Cat., tenue Hopp., arenarium al. In paludosis pr. Baadam Gmel. Diar. Bot. Schrad. 1800, ii. p. 436, in comit Satimeliboo. Borckh. in Roem. Arch. 1 (Eq. hyem. var.) 2*f*.

† *Eq. variegatum.* Caulis semipedalis simplicissimus erectus teres strictus striatus glaber. Vaginæ atræ dentibus albis diaphanis lanceolatis cuspidatis ornatæ. Spica terminalis, W.—Willdenow Species Plantarum, v. 7.

‡ *E. reptans.* Multicaule cauliculis procumbentibus filiformibus nudis scabris tetragonis, vaginarum dentibus setaceis nigris. E. reptans, Wahlenb. in Weber et Mohr. ind. mus. E. hyemale, *α.* tenellum Liljeblad sv. flor. p. 384. E. scirpoides, Michaux. Amer. ii. p. 281, secundum Web. et Mohr, Crypt. p. 60. *β.* variegatum, crassius, cauliculis pentagonis, vaginarum dentibus sublanceolatis albicantibus. Schleich. Catal. n. 21; Eng. Bot. xxviii. t. 1987; Willden. Spec. v. p. 7; Schkuhr Crypt. p. 177, t. 172, b, haud bona. E. nodosum Schrank flor. bavar. Hab. in rupibus elatis montium inferalpinorum Nordlandiæ passim ut etiam in alpibus Lulensibus prope Virih-jaur rarius visum. Quum autem difficulter invenitur ob caules tenues clandestinos vix dubito quin vulgatius sit. *β.* in ripis fluminis Vindelensis, prope Sorsele Lapponiæ Umensis lectum. Tenuissimum sui generis et ab omnibus distinctissimum. Radix longe lateque sub superficie terræ repit ut etiam passim supra terram, simulque passim dividitur in ramos solitarios et dein cauliculos multos exserit, qua re se-

name of *reptans* as having priority, and refers to Weber and Mohr, who speak of it as a manuscript name, and assert, that having compared Wahlenberg's specimens of *E. reptans* with Michaux's specimens of the North-American species, *E. scirpoides*, they find them identical, and consider them distinct from their own *E. variegatum*.* Beck, however, gives the name of *E. variegatum* to the North American species, *E. scirpoides*, and unhesitatingly pronounces them to be identical;† and Wahlenberg, in his comparatively modern work, the 'Flora Suecica,' does not maintain the two varieties which he proposes in the 'Flora Lapponica,' but, without expressing a doubt on the subject, gives his *E. reptans* as the species, and quotes the *E. variegatum* of Willdenow and of Smith as synonymous. It should, however, be observed that the normal form of *E. reptans*, as originally described by Wahlenberg, is a very small mountain form, with a quadrangular stem, and having black setiform teeth to the sheaths: there are European specimens in the herbarium of the late Mr. Winch, now in possession of the Linnean Society of London, but I have never seen similar examples from any part of Great Britain.

The other forms, the sea-shore *E. variegatum* of Smith, and

---

quentem speciem valde refert. Cauliculi ipsi simplices vel ad basin tantum divisi, longitudine digiti, tenuitate fili scabri et duriusculi ut in E. hyemali, quadrisulcati vel tetranguli, remotius articulati: vaginis atris, dentibus setaceis patentibus serrulatis persistentibus. Spica sessilis et e vagina vix exserta, parva, cauliculo duplum crassior; peltis nigris. β. figuræ citatæ Engl.Bot. ex asse convenit nisi spica paullo minor in speciminibus lapponicis. Quin varietas sit plantæ *a.* vix dubito quum vaginulæ etiam in E. reptante interdum albicantes fiunt ad oras. Schkuhrii figura spicas longe nimium crassas exhibet.—Flora Lapponica, 298.

* Nova et pulcherrima species, Eq. scirpoides, Mich. Bor. Am. p. 281, in Uplandia Suec. quoque obvia (Eq. reptans, Wahl. mst. collatis Michauxianis et Wahlenbergg. speciminibus) nec minus apud nos nunc quoque lecta dicitur in Alpp. Tyroll. (Hall. a lit. Zeit. 1804, n. 369). Cum vero hæc exemplaria nondum vidimus speciem uti germanicam recensere nequivimus. Cæterum—cauliculis secundariis e primario reptante confertim erectis, simplicibus gracillimis; vaginis 3-dentatis—statim dignoscenda.—l. c. p. 60.

† Botany of the Northern and Middle States, p. 446.

the river *E. variegatum* of Weber, &c. are certainly indigenous to Great Britain, the former being the plant from the sands of Barry, New Brighton, &c., and the latter having been found by Mr. Johnson, growing on the banks of the canal near Dublin; in several other similar situations, in the same neighbourhood, by Mr. Moore; and in the bed and on the banks of the Dee, in Kincardineshire, by Mr. Brichan. The Dublin plant was the first of these to claim the attention of botanists, and Mr. Moore, after giving the subject every possible attention, gives me his views in the following words:—"I have entered into correspondence with Mr. Wilson respecting the aquatic Equisetum, which you take to be a form of *E. variegatum*, and which I am convinced is a perfectly distinct species. Still I admit it is difficult to fix on characters to distinguish our aquatic plant from *E. variegatum*, and I should say the only *permanent* distinguishing marks are the greater size of the former, its different appearance, and its habit of growing, but these marks are so constant both in a natural and cultivated state that they are worthy of grave consideration. *E. variegatum* is a slender creeping plant, its stems very decumbent, only rising from the ground near the apex; they never have more than six striæ. The aquatic plant is an elegant, bold, upright growing species, with the fronds remarkably straight and stout, and constantly marked with nine or ten striæ, and although not nearly so much inclined to branch at the base, it grows in closer cæspitose tufts. Both species retain their characters in cultivation, under which I have had them growing side by side in peat earth for two years: both are thriving remarkably well, and no two species of a genus can appear more distinct." These observations refer to the aquatic and sea-shore plants, as growing near Dublin. Mr. Brichan, to whom I sent the Dublin canal plant, and to whom we are indebted for such admirable observations on these species, writes me as follows:—"The Dublin plant, of which you sent me specimens, appears to me not only to *resemble* but to be *identical* with that which grows in the Dee." I have next to quote a comparison, also from the pen of Mr. Brichan, between the semi-aquatic and sea-shore plants as growing in Scotland. The sands of Barry, Mr. Don's original locality, and the spot whence we

receive the smallest, most recumbent, and most extreme specimens, is selected as the field of observation. "The *roots* of the Barry plant scarcely differ from those of the Deeside variety. The *stems* are of the same variable length and number of articulations, with 4—10 striæ: they are completely prostrate, except in a few instances, when supported by *Ammophila arenaria*. When not sheltered by that or any other plant, they are brownish on the upper or exposed side and green on the under; it is, however, possible that the brown colour may be the effect of the lateness of the season. On the upper side also the bands of black upon the sheaths run farther down the stem than they do on the under side. The *teeth* are wedge-shaped, not ovate as at Banchory: the bristles are longer, and apparently more persistent. The *catkins* are in general more exserted and matured, and, as well as the stems, have sometimes a reddish tinge. The plant seems to *branch* in the same manner as in the higher and moist situation on Deeside, 150 feet above the sea. When the sand is compacted by small plants which afford no shelter to the Equisetum, the latter is generally very small, slender and filiform; where the sand is loose or the plant has shelter, its growth is much stronger, and in the sheltered situation it is greener. In no case does the plant attain the same size as on Deeside. Some specimens slightly resemble *E. Mackaii*, but are perfectly distinct; the resemblance arises from the bristles being longer, and the amount of black upon the sheaths greater than in the usual state of the plant."* It will be seen that these opposite opinions concerning the two more usual forms of the plant, proceeding as they do from botanists of acknowledged judgment, nearly counteract each other, and the question as to their distinctness or identity, still remains *sub judice*.

The roots and rhizoma, like those of *E. Mackaii*, present no characters by which I can distinguish this species from *E. hyemale*. Like the roots of many other plants when growing in loose sand, those of the present species are frequently clothed with a quantity of matted fibrillæ: the stems are short, often semiprostrate, and the internodes are short and frequently some-

* Phytologist, 447.

what arcuate, giving the entire stem a sinuous appearance.—The figure represents a stout specimen of the New Brighton plant; the four detached stems being portions of rather more elongate specimens: both the sheaths and internodes are striated: the striæ are few in number, six or eight may be taken as the average: under a microscope the cuticle precisely resembles that of the species already described: the ridges appear grooved, being margined on each side with a longitudinal series of minute flinty tubercles: in the furrows are two longitudinal series of stomata placed very near the ridges, indeed so near, that in stems dried in an immature state, they are frequently partially obscured by the ridges. The lower portion of each sheath is generally concolorous with the internode, the upper portion only being black; this causes the sheath to appear much shorter than in the species previously described: the teeth are short, wedge-shaped, and most commonly without the setiform apex or bristle which distinguishes the species last described: their edges are membranous, occasionally black, as represented in the detached stems to the left of the figure, but usually white, giving the plant that variegated appearance from which its name has probably been derived. The catkin is small, apiculate, terminal and striated, as in the two preceding species; its scales are few—from eighteen to twenty-five in number.

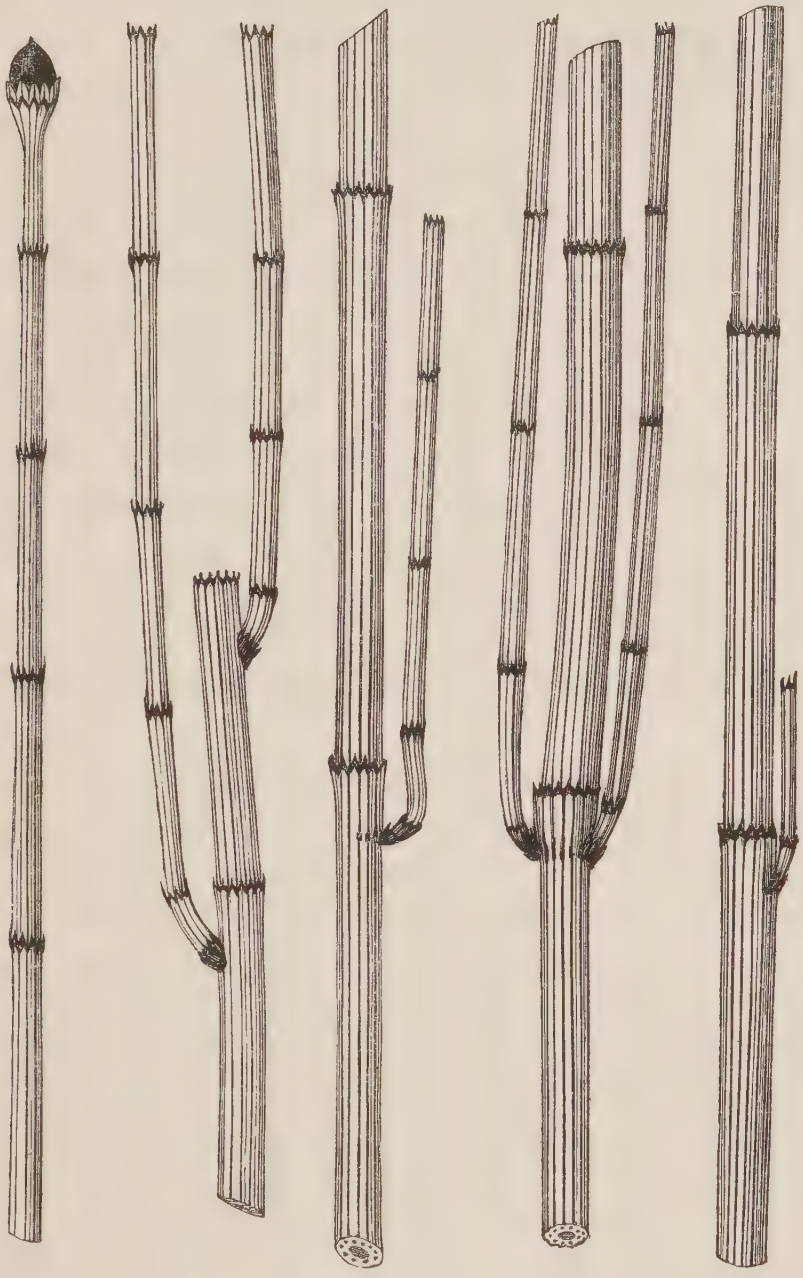
The stem of this species is much less liable to become branched than either of the preceding, still this branching occasionally occurs: in the margin I have represented a New Brighton specimen bearing a branch; the black colouring of the sheath in this specimen extends much lower than is usual, yet the teeth remain wedge-shaped. Specimens occasionally occur in the same habitat repeatedly branched, and much more luxuriant than the one figured at page 31. Of one of these in his own herbarium Mr. Wilson has kindly furnished the following description.

"I have some specimens of *E. variegatum* from New Brighton, opposite Liverpool, which are very much branched and very tall; but even in these I can find only two branches at any one joint.

I will describe one of the best marked of these. Height 22 inches, of which $2\frac{1}{2}$ inches is black, having been buried in the ground to that depth, and rather more. At $2\frac{1}{2}$ inches, two *opposite* branches shoot out, with *rooted bases*. At the next joint are two other *opposite* branches placed at right angles to the first pair. At the next joint are two other opposite branches, and at the next joint is another opposite pair. The right branch, at the seventh joint, has two branches, which are contiguous or nearly so (not opposite), and two more at the ninth in the same condition; two opposite ones at the tenth joint, one branch having the same direction as the two lower branches. In this specimen the main stem is broken off at the height of seven inches; the second primary pair of branches has also one branch ramified, but less remarkably so than the one which I have already given in detail."

The station at Mucruss, in the immediate vicinity of the lakes of Killarney, was discovered by Mr. Wilson. He found the plant growing in water, perfectly erect, with the stems sometimes sparingly branched, but generally simple, and very much resembling the unbranched form of *E. fluviatile*, which it nearly equals in size. Dr. Bromfield, when at Killarney, in the autumn of 1842, most kindly endeavoured to obtain for me living plants, but failed in finding the station, although directed by Mr. Wilson, so that the plant does not, apparently, exist there in any quantity. To Mr. Wilson I am indebted for specimens, accompanied by copious notes and several drawings, from which united sources my observations have been compiled. I have introduced on the opposite page a figure of portions of two separate stems, the actual size, &c., being preserved. Thinking it not improbable that future authors may raise this plant to the rank of a species, I beg to propose for it the name of its energetic and distinguished discoverer; and though I now merely employ the name as distinguishing a variety, I hope that it will be preserved should the plant hereafter be adopted as a species. The following is the description of a stem which I believe to be of average size. Length thirty-eight inches, more than a third of which was submerged, and emits numerous roots: it has three erect branches, the first is situate nineteen inches below the sum-

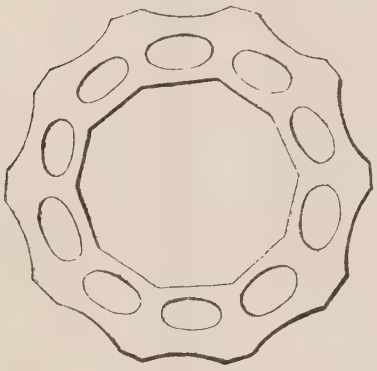
mit, and is broken off at a length of four inches; the second is twenty-two inches from the summit, and is six inches in length; the third branch is one inch lower, is nine inches in length, and has nineteen joints. The main stem is terminated by a catkin.



Equisetum variegatum, var. *Wilsoni*, (natural size).

The stem of this variety has an average number of ten furrows, the ridges between them being broad, as in the usual form, but the siliceous particles are far less prominent, so that the plant does not partake of that asperity which so eminently

characterizes *E. hyemale*, *E. Mackaii*, and the more usual forms of *E. variegatum*, but has a smoother feel, like that of *E. palustre*, the species immediately following. A transverse section of the stem, which is given below, also differs considerably from that of the usual plant, as represented by the right hand figure at page 30. The sheaths are scarcely larger than the stem, with which, in dried specimens, they appear perfectly concolorous, with the exception of a narrow, sinuous, black band, at the summit of each. The teeth are very short, somewhat wedge-shaped, generally blunt, and have obscure membranous margins; but they are so easily injured by carriage, &c., that dried specimens rarely exhibit them in perfection: they vary with striæ from eight to twelve in number. As in the usual form, the sheath of the catkin is much larger and looser than the rest: its teeth are also longer, and their membranous edges dilated and conspicuous. The catkin is small, black, terminal, striated and apiculate.



The most striking characters whereby to distinguish the present from the usual form of the species, are its great size, both as regards height and stoutness, its erect habit, its aquatic locality, and the comparative smoothness of the stem. Mr. Wilson appears to attribute the great size and erect habit to its aquatic locality, and its greater smoothness to the combined influence of water and the soil of the district in which it grows; and he expresses to me his unwillingness to admit it as a species. It may indeed be urged that the erect aquatic plant from Dublin and Kincardineshire is somewhat intermediate; indeed Mr. Moore, who insists on the distinctness of the Port Marnock and Dublin canal plants, identifies the latter with the Mucruss variety: in this opinion I cannot concur without additional evidence in its support, the very different degree of roughness in the stem being alone a sufficient diagnostic.

I will now recapitulate, in the form of a list, the remarks contained in the foregoing pages on the various unbranched forms of Equisetum which I have had occasion to mention.

1. *E. hyemale*, Linneus. Sheaths black, with a whitish band in the middle, terminating in a series of obtuse segments, and exhibiting, under a lens, traces of teeth, which appear to have been broken off: habit erect: habitat watery places in both continents.

2. *E. Mackaii*, Newman = *E. elongatum*, Hooker. Sheaths black throughout, terminating in long, aristate, somewhat flexuous teeth: habit erect: habitat watery places in the north of Britain.

3. *E. ramosum*, Schkuhr. Sheaths terminating in long, aristate teeth, concolorous with the internodes: habit erect: habitat watery places in Europe (and Wales?)

4. *E. scirpoides*, Michaux. Sheaths terminating in three setiform teeth: habit prostrate: plant very minute: habitat among moss, at the roots of trees, in North America.

5. *E. reptans*, α. Wahlenberg. Sheaths terminating in four setiform teeth: stem quadrangular: habit prostrate: plant very minute: habitat bare mountainous regions in Lapland.

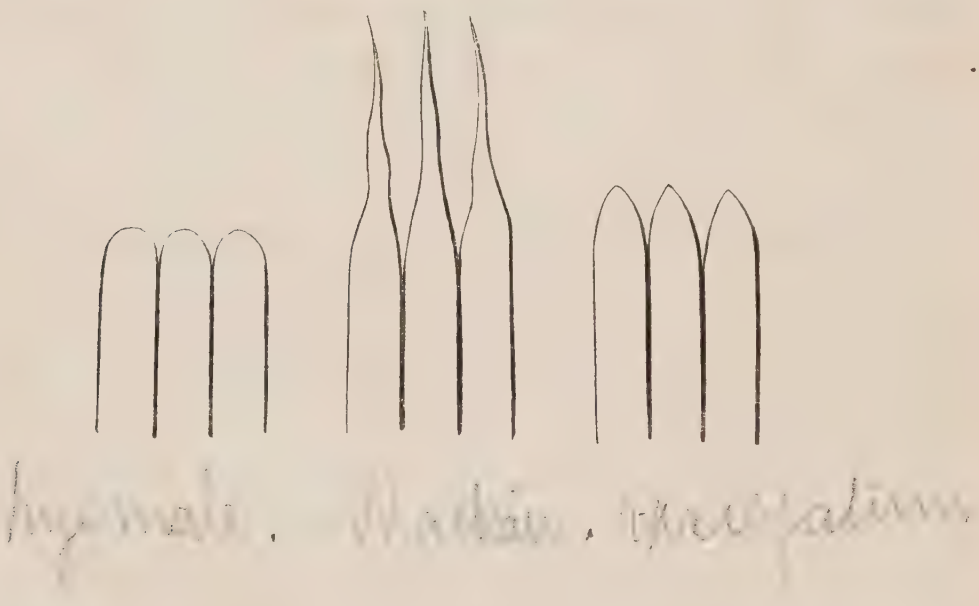
6. *E. arenarium* (apparently a MS. name, quoted by Weber and Mohr, and doubtless the *E. variegatum* of Smith). Sheaths having the upper portion only black, the lower concolorous with the internodes, terminating in obtuse segments, with white marginal membranes, occasionally having their apices prolonged and setiform: habit prostrate: plant of various sizes; habitat sands of the sea-shore, Barry, Southport, Bootle, New Brighton and Port Marnock.

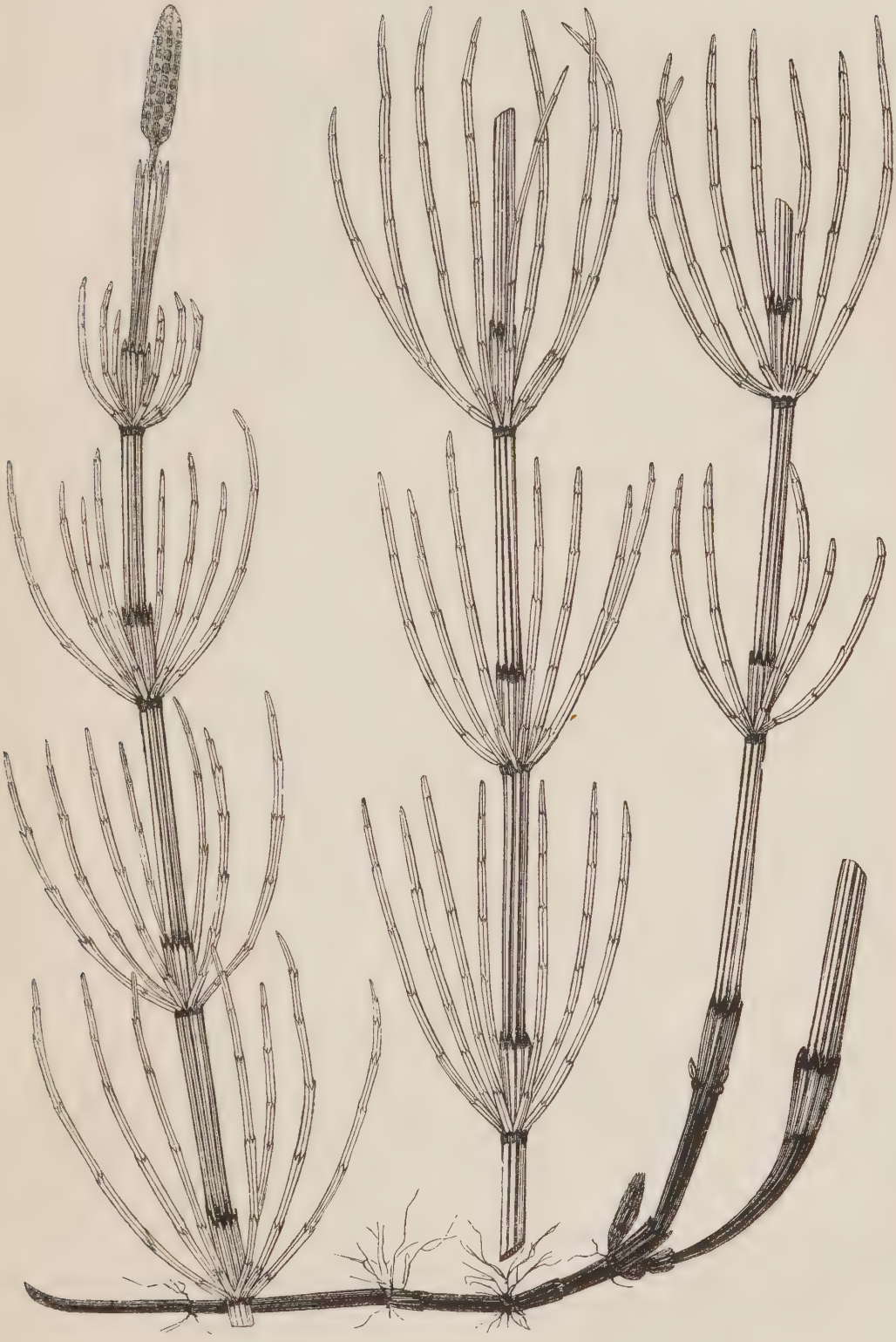
7. *E. campanulatum*, Poiret. This appears to differ from the preceding only in having the sheaths larger and looser: I have not seen it.

8. *E. variegatum*, Weber & Mohr. Sheaths as in No. 6: habit erect, tall: habitat in the water, or on the wet banks of rivers, canals or ditches, Kincardineshire, Dublin.

9. *E. Wilsoni*, Newman. Sheaths concolorous with the internodes, except a black ring at the summit: teeth short, obtuse: stem smooth: habit erect, tall, stout: grows in water at Mucruss.

The characters of the sheath and its teeth will not, I fear, furnish us with a very safe guide, since I find modifications of the same structure obtaining in all the species hitherto described: the ribs of the stem are arranged in proximate pairs, which pass into the sheaths, and one pair enters each tooth, generally terminating in an obtuse somewhat rounded extremity; the furrow between the ribs constituting the pair, is continued as a black bristle, the margins of which are furnished with a whitish semihyaline membrane; this bristle, together with its marginal membrane, give an outline to the tooth. The diagrams below represent the outline thus given to the teeth in the three species: — the left hand figure represents *E. hyemale;* the middle figure *E. Mackaii;* and the right hand figure *E. variegatum.* In the variety *Wilsoni* the outline is somewhat more obtuse than in the last of these. I have selected for the figures examples in which the characters are strongly marked: I believe others may be found exactly intermediate.





MARSH EQUISETUM, (*natural size*).

EQUISETUM PALUSTRE, *Linneus.*

This species appears to be generally distributed : it occurs in all the county lists of ferns which I have received, and is rarely mentioned either as local or uncommon. In Ireland I found it particularly abundant, especially in the north : in the vicinity of the Giant's Causeway I observed several large patches of ground densely covered with it. I have not seen it in such profusion elsewhere.

The old figures usually quoted as representing this plant must be received with considerable doubt. Those of Gerarde* and Lobel,† evidently printed from the same block, represent a plant growing in the water, and having one erect and unbranched stem, and another branched, and somewhat resembling the present species. Ray's figure‡ represents a variety hereafter to be noticed. The modern figures of course more nearly resemble the plant : that in English Botany is very good.

Gerarde's description appears to comprehend more than one species, — "the great thicke jointed stalk" describing *Eq. fluviatile* of Linneus, while the roughness and hardness seem inapplicable to that species. I subjoin the passage as it stands in the Herbal. "Water Horse-taile, that growes by the brinks of riuers and running streams, and often in the middest of the water, hath a very long root according to the depth of the water, grosse thicke and jointed, with some threds anexed thereto : from which riseth vp a great thicke jointed stalk, whereon grow long rough rushy leaues pyramide or steeple fashion. The whole plant is also tough hard and fit to shave and rub woodden things as the other."

It is not however only in these ante-Linnean works that the synonymy of this and the following species is involved in obscurity. Our modern authors, I regret to say, have hitherto done but little towards the elucidation of the nomenclature. In the hope of making the subject somewhat more clear, I have introduced, in the Appendix, § some observations on the specimens in the Linnean herbarium. Unfortunately, the Linnean characters are frequently obscure, owing to the constant endeavour of their celebrated author to make them as concise

* Ger. Em. 1113. † Lobel, 795. ‡ Syn. tab. v. fig. 3.

§ See Appendix C.

as possible: in such case a reference to the specimen becomes indispensable.

In a plant of which the synonymy is so imperfectly known as the Marsh Equisetum, it is by no means an easy task to trace the record of medical and other properties. Haller seems to have collected together a number of wise saws from a variety of sources, and gives them under his Equisetum No. 1677: but not only do I doubt whether the whole of them were intended for any one species, but I also doubt whether his No. 1677 is confined to the species now under consideration. The point is not worth a very rigid scrutiny. He makes out his No. 1677 to be hurtful to oxen and cows, giving them diarrhœa and making their teeth loose: in the same passage he also speaks of the great difficulty of extirpating his No. 1676, which is probably *E. arvense*, from a field where it is once naturalized: of the uses of either as a medicine he does not speak with certainty.*

The roots are slender and frequently divided; they appear to spring from the joints of the rhizoma, and are generally covered with minute fibrillæ. The rhizoma is creeping, and extends to a great length; it is of nearly the same diameter as the stem, very black and shining, and smooth to the touch: at the joints it is solid, but the internodes are more or less hollow.

The engraving at page 43 of this work represents a stem of Marsh Equisetum of the natural size and proportions: in order to exhibit the whole at one view, the stem has been divided into three portions. The stem is perfectly erect, about fifteen inches high, deeply furrowed and finely granulated: the furrows are

* Haller, 3. 2. 1677. Hoc equisetum paulo minus quam 1676 tamen et ipsum pecori nocet et dentium facit in bobus et vaccis vacillationem tum diarrhœam. Cum seductus pulchritudine Trifolii Equiseto 1676 inquinati, famulus, qui boum meorum curam gerebat, semel aut iterum vaccam nuper vitulam enixam hac pestilente herba aluisset, ex diarrhœa immedicabili eadem periit. Quare magnis pecuniis nostri arcanum redimerent, quo prata infaustissima herbarum liberarent. Mihi neque aratrum, neque fimus, neque alia cura profuit. Equis non nocet, neque ovibus et rangiferis. Porci nostrates recusant, cum in Suecia non detrectent. Radicibus tamen glandium simile aliquid sæpe adhæret, quod porcos credas requirere.

Vires medicas vix satis certas autumo. Aquosa planta est, parum acris: ei adstringentes vires tribuerunt in diarrhœa, in hæmoptoe efficaces, &c. &c.

eight in number, the granulations of the ridges between them feel slightly rough to the nail if drawn along them. The stem is divided into eleven compartments by means of transverse septa; the internodes are an inch and a quarter or an inch and a half in length: the sheaths occur at the septa, and correspond in number; they considerably exceed the stem in circumference, and in consequence are loose: the ridges of the stem enter the sheaths, and each then divides into two parallel portions, and terminates in one of the teeth, which are eight in number, acute, wedge-shaped, tipped with black, and furnished with nearly transparent membranous edges. There are nine whorls of branches: these rise from the furrows of the stem, close to the base of the sheaths; they never exceed the furrows in number, and are frequently fewer; the short sheath at the base of each is black, and these form a series of black rings round the stem: they are divided into six or eight joints, of which the basal and apical are the shortest: they are generally five-ribbed, and the sheaths occurring at the joints are five-toothed, each tooth receiving one rib, which is always divided before its termination, and the divisions do not ascend to the extreme apex of the tooth; the teeth are tipped with brown, and are furnished with semi-hyaline marginal membranes: the branches vary greatly in length.

The catkin is long and rather narrow; when mature it stands on a distinct stalk of its own length: it is terminal, and after discharging its seeds it appears to perish, the stem and branches continuing to retain their vigour. There is no apiculus, the extreme summit being composed of a scale similar to the rest: at first the scales are crowded together, forming a black mass, they afterwards separate, the peduncle supporting each becomes visible, and the catkin, increasing in length, assumes a brown colour. The catkin appears in May and June.

This species is subject to extraordinary variations, three of which have received distinguishing names.

The first of these appears to be universally known by the name of *polystachion:* it is at once distinguished by its numerous catkins: these are usually and principally borne on the two upper whorls of branches; the main stem generally terminating

in a catkin of uniform size with the others, as represented in the figure, which is drawn from an exceedingly beautiful specimen, kindly lent me by Miss Griffiths. At other times the stem bears a catkin of the normal size and form, while those on the branches are comparatively diminutive in size: for specimens of the latter form I am indebted to several kind correspondents.

Equisetum palustre, var. *polystachion*, (natural size).

I may remark that the catkins in this form of the plant are usually small, and in the specimens which have come more especially under my notice, they are very black and compact,

much more so than the single apical catkin of the normal form of the plant, and hence they much more nearly resemble those of the preceding species: in other respects this plant so nearly approaches the normal form, that a more minute description appears unnecessary.

It was supposed by Bolton that this variety was caused by the primary stem having been bitten off, but Dr. Wood remarks* that in all the specimens he has seen "the terminal catkin of the main stem was present, thus clearly proving that the proliferous condition is not dependant on the accidental circumstance of the top of the plant having been cropped or destroyed." As I have never seen the plant without the terminal catkin, I entirely agree with this observation.

The second variety is not so familiar to botanists; it is, however, widely but sparingly distributed. I am indebted to Miss Griffiths for specimens from Braunton Burroughs in Devonshire, to Dr. Greville for others from the sands of Barry, and to Mr. S. Gibson for the loan of others from Aldingham, Yorkshire, and Broadbank, Lancashire.

This plant, as will be seen from the figure, differs principally from the normal form in being without branches, or nearly so, the occurrence of a few scattered ones being occasional only, and constituting the exception rather than the rule. I have little doubt of its being the *E. palustre* γ. *nudum* of Duby and De Candolle,† and an intermediate form between this and the usual plant is probably the *E. palustre* β. *alpinum* of Sir W. J. Hooker.‡

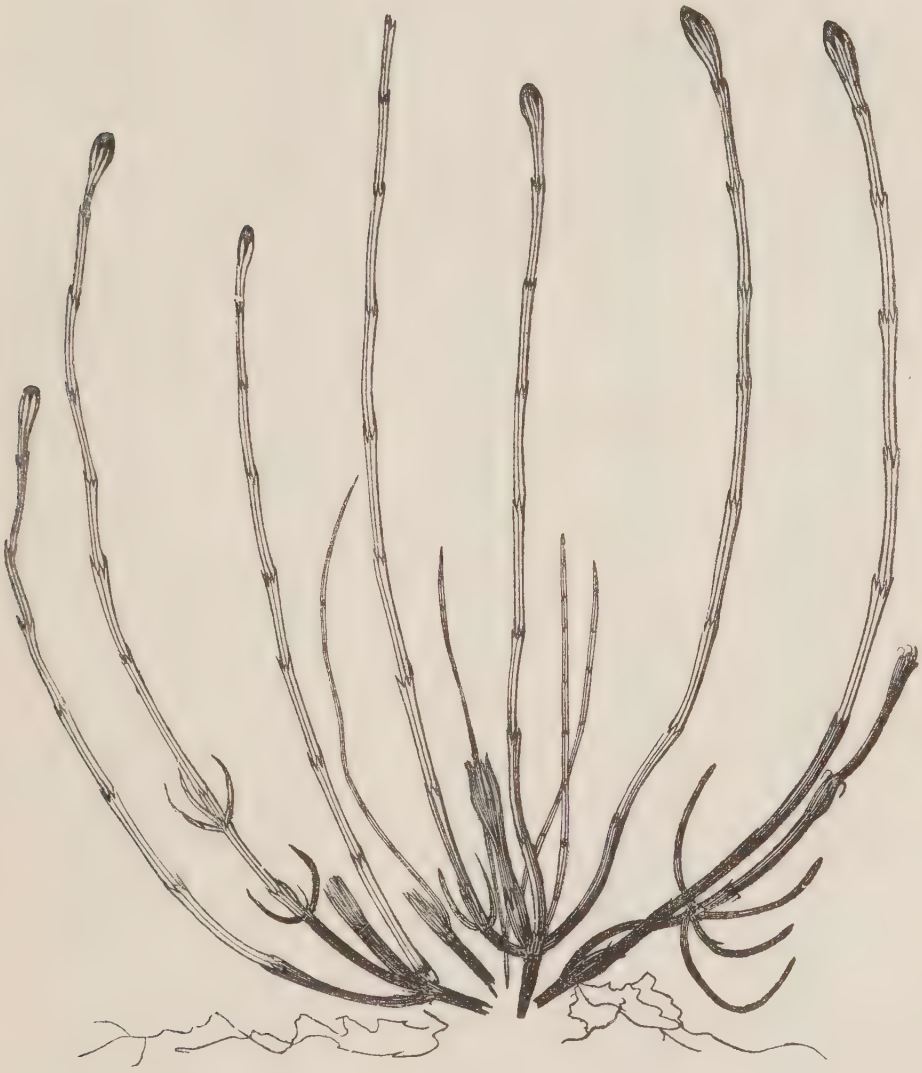
The specimens vary considerably in size as well as general appearance: those from Scotland, Yorkshire and Lancashire, are very small, the stems not attaining on the average more than a length of two inches: those from Devonshire are somewhat larger—the figure on the opposite page represents a Devonshire specimen of the natural size,—and I have seen others of a still more luxuriant growth. Some of the examples are erect, others prostrate, and those which grow on sand banks have the roots

* Phytologist, 482.

† Botanicon Gallicum, i. 535, of the second edition.

‡ Hooker's British Flora, p. 451 of the fifth edition.

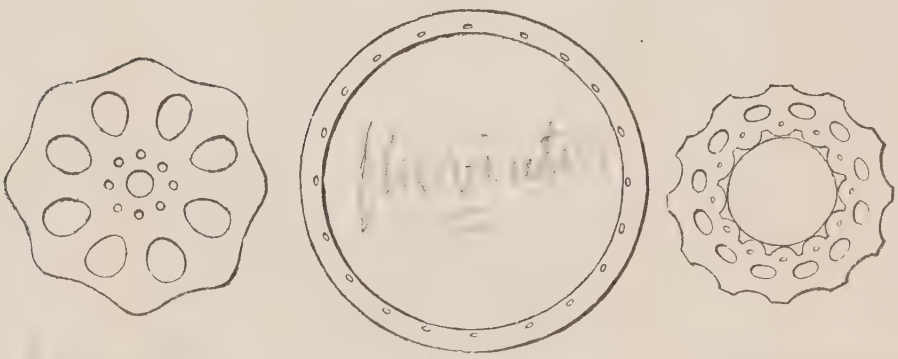
densely fibrous and clothed with minute fibrillæ. The small size, often prostrate habit, branchless stems, sandy habitat and densely clothed roots, have induced many botanists to consider this plant a variety of *E. variegatum* rather than of *E. palustre:*

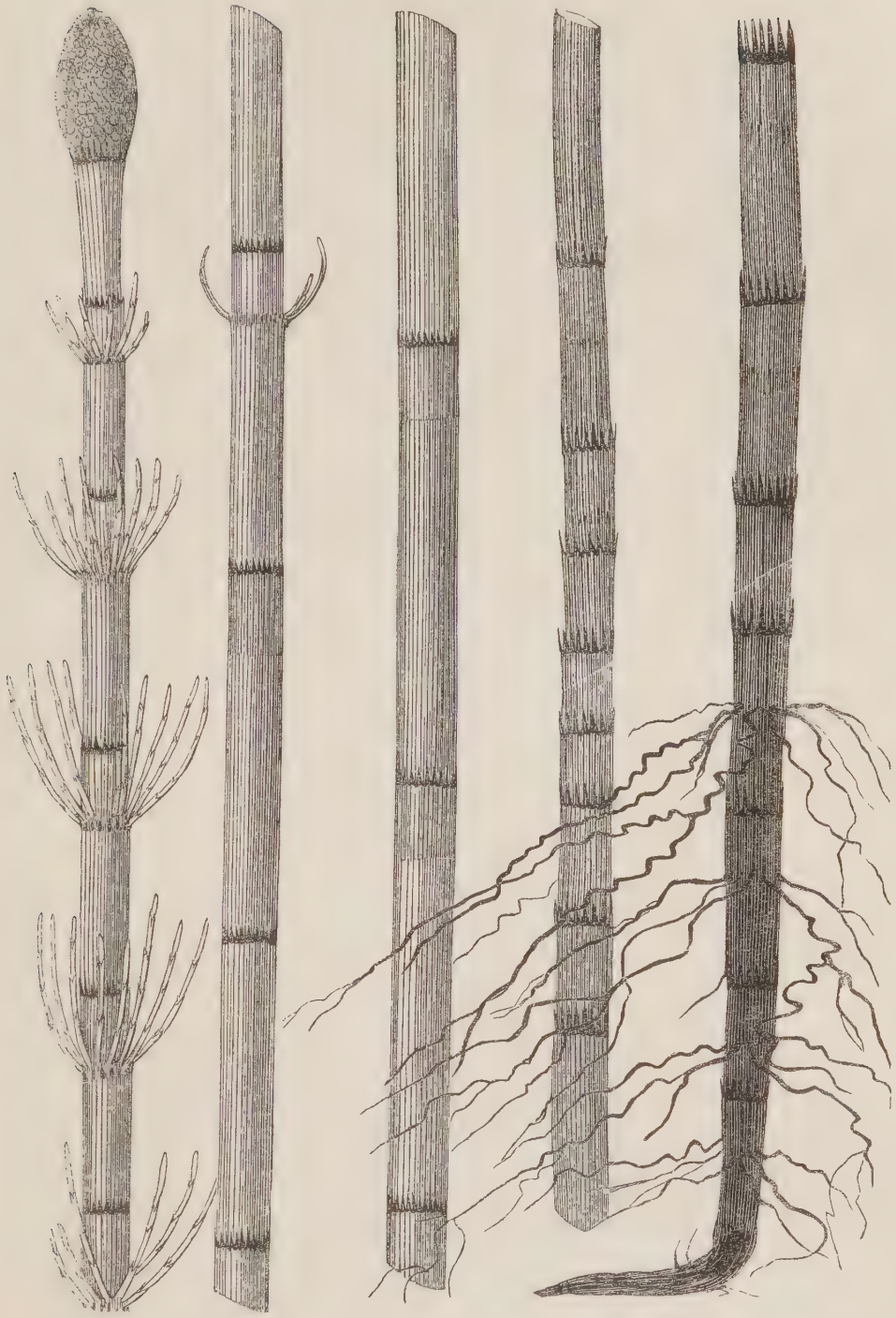


Equisetum palustre, var. *nudum,* (natural size).

but after a careful examination I am unable to find any characters whereby to distinguish it from the latter; the root, stem, sheaths and catkins, seeming to me nearly identical with those of the usual form of the species.

I have introduced on the present page sections of the stem of three species of Equisetum. The left-hand figure represents *E. palustre;* the middle figure *E. fluviatile;* and the right-hand figure *E. sylvaticum*. Botanists of some eminence have treated *E. palustre* and *E. fluviatile* as varieties of the same plant; and even the great Linneus suspected this to be the case, although he assigned a separate name to each. A glance at the figures will be sufficient to convince an enquirer of the fallacy of this hypothesis, since the discrepancy in this respect is greater between *E. palustre* and *E. fluviatile*, than between any two species I shall have occasion to describe. Although a comparison of these sections is by no means new, yet I think but little stress has hitherto been laid on its value. I very strongly recommend it to the attention of botanists.





WATER EQUISETUM, (*natural size*).

EQUISETUM FLUVIATILE, *Linneus.*

Equisetum limosum, Smith, Hooker, Babington.

THIS species is by far too generally distributed to allow of my giving a list of habitats: it occurs very commonly in ponds and

ditches, and occasionally in running streams, the roots and a portion of the stem being immersed in water.

Concerning the nomenclature of this plant Sir J. E. Smith has led us into an error, which I have lately endeavoured to point out ;* and although no one who has investigated the subject expresses doubt as to the fact that the species figured on the preceding page is the *E. fluviatile* of Linneus, yet several eminent botanists prefer adopting Sir J. E. Smith's nomenclature to that of Linneus, on the ground that the former is now established in this country. Without making any attempt to argue the point with these gentlemen, I revert to the Linnean nomenclature simply on the ground of its being the highest authority: if they could point out that I misapplied the Linnean name I should instantly yield, but while they admit that my nomenclature is also that of Linneus, it does not appear to me that I am at liberty to adopt or reject it in accordance with any views of my own. Instead therefore of making any attempt to explain why I adopt the Linnean nomenclature, and to defend myself for so doing, I confine myself to the more simple task of showing that it is the Linnean nomenclature which I have adopted. In the first place the adjective *fluviatilis* is certainly descriptive of a plant which is always half immersed in water, whether of rivers, lakes or ditches ; and, on the contrary, it is altogether unsuited to Smith's *fluviatile*, which generally affects dry land, and which appears unable to exist in the water. In the second place, the description, "*frondibus subsimplicibus*" or "*stems almost without branches*," is clearly descriptive of the present plant, but cannot be supposed to describe Smith's *fluviatile*, in which the stems are most abundantly branched. In the third place, Linneus marks the species as one in his possession; and, on turning to his herbarium, we find four specimens all identical with the plant I have figured : and we do not find, either from the evidence of name, description or specimen, that Linneus had ever seen or was aware of the existence of such a plant as the *E. fluviatile* of Smith. Moreover, Linneus observes in a MS. note to his *E. fluviatile*, "*Fortè mera varietas prioris* (palustre) *ex solo aquæ profundioris*," — "perhaps a mere variety of *E. pa-*

* Phytologist, 533, 689.

lustre growing from the bottom of deeper water :"—from this it is most evident to me that Linneus never contemplated describing a plant which seems less partial to water than most of its congeners. It further appears that Sir J. E. Smith was perfectly aware of the fact I am now endeavouring to establish, for he has written in pencil, under the specimens of *E. fluviatile* in the Linnean herbarium, the word "*limosum?*" and has added, probably at a later period, the word "*certè.*" It may be presumed that he made this discovery subsequently to the publication of the 'English Flora,' as we find no mention of the identity thus made out. Lastly, and it may possibly have some weight with those who desire the establishment of a uniform nomenclature, I may add that the present plant is the *E. fluviatile* of the 'Flora Danica,' * of Wahlenberg's 'Flora Lapponica' † and 'Flora Suecica,' ‡ and of Dr. Dietrich's lately published work on the Cryptogamia of Germany.§ Wahlenberg has taken great pains clearly to point out the error of Smith's nomenclature, and tells us that the species now under consideration is named *fluviatile* in all the old Swedish herbaria; and he more particularly alludes to that of Zeirvogelius, the companion of Linneus in his Gothland journey, as one of the highest authority; and he remarks that Smith's *fluviatile*, the *E. Telmateia* of Ehrhart, never grows in rivers, neither has it ever been found in Sweden or Lapland, in both which countries the present species is most abundant.

The medicinal properties of this plant have been so variously stated that they appear to contradict each other. With regard to its economical uses Linneus gives us, in his 'Flora Suecica,' a very definite statement that in Sweden it is cut up as food for cattle, in order that the cows may give more milk; ‖ and in his 'Lachesis Lapponica' he observes that "the rein-deer fed with

* Flora Danica, 1184 (according to Smith). † Flora Lapponica, 297.
‡ Flora Suecica, 690.

§ Deutschlands Kryptogamische Gewäsche von Dr. D. Dietrich, p. 5, pl. 1, also, according to Smith, of Ehrhart's 'Decades Plantarum Cryptogamicarum &c. 41, and 'Plantæ Officinales' &c. 290.

‖ Dissecatur in pabulum Boum, ut vaccæ lac copiosius præbeant. — Linn. 'Flora Suecica,' p. 368, n. 390, of the 2nd edition.

evident avidity on the great water horse-tail (*Equisetum fluviatile*), which the Laplanders call *Aske*, though it was in a dry state, and though they will not eat common hay. How unaccountably negligent" he continues, "are the Laplanders, not to collect in the course of summer a stock of this plant, and of the rein-deer moss (*Lichen rangiferinus*), for winter fodder! They would then have some provision for the herd, when the country is covered with an impenetrable crust of frozen snow, and not hazard the loss of all they are worth in the world."* There seems to be very contradictory evidence, even within the range of our more immediate observation, as to its being eaten by horses, cows and sheep. I have seen it growing luxuriantly in ponds in Herefordshire, in situations accessible to cattle, but I never could perceive that a stem had been eaten; but more recently, in the ditches which intersect the rich pasture land in the Isle of Dogs, I observed that nearly every stem within reach from the bank had been cropped at a nearly uniform height: horses, horned cattle and sheep, are constantly feeding in these meadows. We learn from the following passage, extracted from Mr. Knapp's amusing 'Journal,'† that this Equisetum is a favorite food of the common water-rat, (*Arvicola amphibia*). "A large stagnant piece of water in an inland county, with which I was intimately acquainted, and which I very frequently visited for many years of my life, was one summer suddenly infested with an astonishing number of the short-tailed water-rat, none of which had previously existed there. Its vegetation was the common products of such places, excepting that the larger portion of it was densely covered with its usual crop, the smooth horsetail [*Equisetum fluviatile*]. This constituted the food of

* 'Lachesis Lapponica,' ii. 107, of Sir J. E. Smith's translation. The following parallel passage occurs in the 'Flora Lapponica,' p. 322. Rangiferi, Lapponum pecora, fœnum per hyemem non adsumunt facile, hinc Lappo noctes diesque eos per sylvas ducere tenetur. Obtuli circa autumnum redeuntibus ex longo itenere Rangiferis fasciculum fœni, et observavi eos hanc plantam seligere et adsumere, reliqua fere intacta relinquere. Annon itaque hocce Equisetum majorem œconomiæ lapponicæ usum adferre posset, incolis judicandum relinquo.

† Journal of a Naturalist, page 143.

the creatures, and the noise made by their champing it we could distinctly hear in the evening at many yards' distance."

The roots of the water Equisetum are numerous, black, fibrous and sinuous: they spring from the bases of the submerged sheaths in a manner precisely similar to that of the branches, and those which originate near the surface of the water not unfrequently ascend for a time in the same way. The rhizoma is creeping, and extends horizontally in every direction, forming a matted mass in the mud of ponds and ditches where the plant occurs: it is of a brown colour, with jet black sheaths, which are rather more approximate than in ascending stems, but in other respects scarcely different. In winter, when the exposed portion of the stem of the preceding year is dead, the remaining portion becomes prostrate on the mud, still however retaining some of its lower branches, which may be seen in the summer in a state of incipient development: these, together with others in a still younger state, form the ascending stems of the ensuing year.

The engraving at page 51 represents a moderately sized stem of the water Equisetum, of its natural size and proportions: one much larger might have been selected, but its representation would have been more difficult. The stem is perfectly erect, and about twenty-five inches in height, of which seventeen inches were above water, and the remainder submerged. The submerged portion is smooth, the apical portion slightly striated, (the striæ are much more distinct in immature and barren stems): its average diameter is a quarter of an inch: it is divided by transverse septa into thirty compartments, thirteen of which were above, and the remainder below the surface of the water: the internodes above water vary from three quarters of an inch to an inch and three quarters in length; those submerged are much more crowded. The sheaths are about a quarter of an inch in length; they are green, concolorous with the stem, and of nearly equal diameter, so that they clasp it very tightly: the teeth are sixteen to twenty in number, sharp-pointed, always distinctly separated, black or dark brown, and not unfrequently furnished with a very slender, white, membranous edge. There are six whorls of ascending branches: these rise from the base of the sheaths from

the second to the seventh internode inclusive. The branches in each whorl vary from five to seventeen in number: they are divided into joints, varying from five to ten in number, and have from five to eight striæ, with corresponding ridges. Each of these ridges becomes double or divided on entering the sheath, but the two portions are again united before terminating in the extreme points of the brown-tipped teeth: the internodes of these branches are extremely variable in length, the first and last being the shortest: the branches also vary greatly in length.

The catkin is short, ovate, gibbous and terminal; and the stalk on which it stands is short, scarcely exceeding in length the sheath which encloses it. I can discover no apiculus, the extreme summit being composed of scales similar to the rest: these are generally more than a hundred in number; externally they are quite black, but as they separate about Midsummer, by the ripening of the catkin, a common receptacle of ivory whiteness is disclosed.

This species is extremely subject to variation, so much so that the preceding description will only suffice to give a general idea of a fertile stem. Some are entirely unbranched, others sparingly branched, and others again more numerously branched: the site of the branches also varies, commencing variously at the second, third, fourth, fifth, sixth or seventh sheath, and forming two, three, four, five, six, seven or eight whorls. When quite unbranched, whether fertile or barren, I have no doubt that it is the '*Equisetum nudum lævius nostras*' of Ray,* the habitat, figure, &c., closely corresponding; this form is also the *E. limosum* of Linneus, who, in his 'Systema Vegetabilium,' quotes Ray's description and figure; but it should also be observed that subsequently, in his 'Flora Lapponica,' he omits all notice whatever of this unbranched form, apparently not considering it worthy of a place even as a variety. The fertile stem occasionally becomes proliferous, as in the preceding species, but much more rarely. Mr. Luxford possesses a specimen of this kind, found in a mill-pool, by the Bristol-road, Birmingham; and in Sir J. E. Smith's herbarium is a Swiss specimen from Mr. Davall, as

* Synopsis, 131, tab. 5, fig. 2, a, b.

recorded in the 'English Flora,'* but the author remarks that he has seen no such variety in England.

The barren stem is much longer than the fertile, and varies in an infinity of ways: among a few which I have lately gathered in the ditches of the Isle of Dogs, where this plant abounds, but can scarcely be said to flourish, I select the following as instances of variation.

A—is forty-three inches in length, and has thirty-seven joints, without a single branch.

B—is forty-five inches in length, and has forty joints: from the first to the nineteenth inclusive these are branchless, the twentieth has one branch, the twenty-first two branches, the twenty-second two, twenty-third to the fortieth inclusive one branch each.

C—is forty-five inches in length, and has forty joints: these, from the first to the fifteenth inclusive are branchless, the sixteenth has one branch, the seventeenth has two branches, the eighteenth thirteen, the nineteenth eleven, the twentieth nine, the twenty-first nine, the twenty-second ten, the twenty-third ten, the twenty-fourth seven, the twenty-fifth eight, the twenty-sixth two, the twenty-seventh two, the twenty-eighth two, the twenty-ninth one, the thirtieth three, the thirty-first none, the thirty-second two, the thirty-third none, the thirty-fourth one, the thirty-fifth and thirty-sixth none, the thirty-seventh two, the thirty-eighth two, and the thirty-ninth and fortieth none.

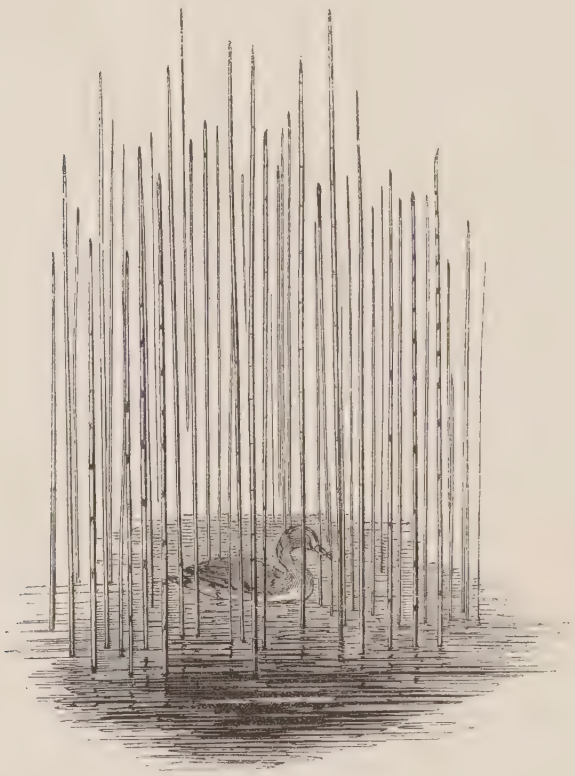
D—is forty inches in length, and has thirty-eight joints: from the first to the sixteenth inclusive, and also the eighteenth, twenty-fourth, twenty-seventh, twenty-ninth, thirty-first, thirty-third, thirty-fifth, thirty-sixth and thirty-eighth are branchless; the seventeenth, nineteenth, twenty-first, twenty-third, twenty-fifth, twenty-sixth, twenty-eighth, thirtieth, thirty-second, thirty-fourth and thirty-seventh have one branch each, the twentieth has two branches, and the twenty-second three branches.

It should also be observed that stems, which at first are perfectly unbranched, often throw out a few scattered branches as the season advances, so that it is almost impossible to lay down any formula of branching that shall be at all constant.

* English Flora, iv. 326.

In barren stems the apical joints appear to be invariably branchless and very much attenuated, while the median and lower joints are generally more or less branched: the inferior branches, especially when their insertion is submerged, are much stouter than the superior ones, and are often furnished with whorls of branches, like the main stems.

In the vignette below I have attempted to represent the natural appearance of the unbranched form of this species, which has already been alluded to as the *E. limosum* of Linneus, and the *E. nudum lævius nostras* of Ray.



WOOD EQUISETUM (*natural size.*)

EQUISETUM SYLVATICUM, Linneus.

THIS plant, although local, is very widely distributed, occurring in moist shady woods throughout the kingdom. It grows in woods in the Hampstead and Highgate district: I am indebted to Mr. Pamplin for specimens gathered at the latter place, and

it is remarkable that it was observed there as long since as the time of Lobel, who records the habitat in his 'Illustrationes Stirpium,'* published in 1655, disguising the English appellation of 'Highgate,' under the scientific term of '*Altæ Portæ*.' The other English habitats with which I have been furnished through the kindness of correspondents, are so numerous that a mere list of them would exceed the space I can afford for localities. In Wales it occurs in many localities, particularly at Hafod, and near the Devil's bridge, in deep shaded ravines, occasionally straggling into open and exposed places, but then partially divested of its characteristic elegance. In Scotland, I observed it growing with peculiar luxuriance in the vicinity of Loch Fyne, in a little fir-wood on a hill side. The fructification had entirely disappeared, and each stem had attained its full development, and every pendulous branch its full length and elegance. Altogether I could have fancied it a magic scene, created by the fairies for their especial use and pleasure, and sacred to the solemnization of their moon-lit revels. It was a forest in miniature, and a forest of surpassing beauty. It is impossible to give any adequate idea of such a scene, either by language or illustration. In Ireland I observed it in the counties Wicklow, Antrim, Londonderry and Donegal; and Mr. Mackay appears to consider it of common occurrence in moist woods and hedge-banks, particularly in mountainous situations: Dr. Balfour has kindly supplied me with specimens of a peculiarly dwarf growth and rigid habit, which he found near Oughterard, in Cunnemara.

The figures of this plant are for the most part characteristic, although some of the older ones might have been more satisfactory. It is so distinct in its appearance and characters that one can hardly fail of recognizing it if drawn with even a moderate degree of accuracy. For the same reason all authors appear to agree in its name, and we thus escape the trouble of investigating a confused synonymy.

The roots of the Wood Equisetum are fewer in number and somewhat smaller than those of the species already described: they are brown, tortuous, occasionally branched, and generally

* Illus. Stirp. 149.

clothed with fibrillæ: the rhizoma is horizontally extended, branched and striated; in many places it is clothed with fibrillæ like those of the roots: it is throughout of a dark brown colour.

The stems are of two kinds, fertile and barren: both, when mature, are usually furnished with compound branches. The fertile stems rise from the ground perfectly naked, but most of them soon exhibit incipient branches just at the base of the upper sheaths; these quickly elongate into compound branches, forming several whorls: a few of the stems remain unbranched, and quickly disappear. The number of whorls varies from two to eight; I have rarely met with the latter number, and never with more. Long after the catkin has decayed, these whorls of branches continue vigorous for a short time, and combine in giving a blunt appearance to the entire frond. The stems are of a dull, sickly, green colour, succulent and striated: the striæ are about twelve or fourteen in number, and the ridges between them are armed with minute siliceous points, but these are insufficient to communicate much roughness or harshness to the plant. The sheaths are very long and loose, terminating superiorly in three or four large conical lobes, containing on an average three striæ in each; the inferior portion of these sheaths is concolorous with the stem, the superior or apical portion is of a bright russet brown colour.

The catkin is elongate, somewhat pointed, and of a pale brown colour; it stands on a slender stalk, of rather more than its own length. The scales of the catkin are eighty and upwards in number. The catkin is ripe in April.

The barren stems are about eighteen inches in length, and make their appearance almost simultaneously with the fertile ones, but are more slender, and the sheaths are much smaller, although similarly formed and coloured. The whorls of branches are from ten to twenty in number, and the branches composing each whorl gradually decrease in number and length towards the apex, which is extremely slender, so much so, that unable to bear its own weight, it droops on one side, and is not readily to be distinguished from the surrounding branches. The striæ are more distinct than in the fertile stem; three or four of the ridges run into each of the lobes of the sheaths, and unite in its apex.

The branches are very slender, long, and drooping; they are commonly divided into twelve or fourteen joints, of which those near the apex are the shortest, and the basal one is generally rather shorter than those immediately following it, which are the longest of all, and emit from near their extremities other slender, long, and drooping branches. The ultimate branches are generally triangular or three-ribbed, each joint terminating in three long pointed teeth, which are nearly concolorous with the branches, and one of the ribs ascends undivided to the extreme apex of each tooth. The figure below represents a barren stem.

SHADY EQUISETUM (*natural size*).

EQUISETUM UMBROSUM, Willdenow.

Equisetum Drummondii, Hooker.

"FOR this addition to the [British] species of Equisetum we are indebted to Mr. Thomas Drummond, who found it on the banks of the Isla and Esk, in Forfarshire, extending up the val-

leys almost to the sources of those rivers."* Dr. Greville, who has obligingly supplied me with specimens, has since discovered it in woods near Forfar; and Dr. Balfour, to whom I am also indebted for specimens, has supplied me with the following list of Scotch localities :—" Woodcockdale wood, near Linlithgow; in woods at Castle Campbell, near Dollar; in a wood at Carlochar glen; head of Glen Isla; in Campsie glen and Finglen, near Glasgow; in woods near Corra Lin, Lanarkshire; in woods near Dunfermline; and in woods at Auchindenny, near Edinburgh."

This species has also been found in Ireland. Mr. Moore, of the Glasnevin Botanic Garden, says, " I suppose this species is not unfrequent in the county Antrim, on the sides of mountain glens where the geological formation is similar to that at Wolf-hill, *viz.* lias mixed with hardened chalk, but of this I am not exactly sure: the only place where I have collected specimens was a deep mountain glen near Cushendall, called Glendoon: I took it for a variety of *E. sylvaticum*, not being then acquainted with the species; but on comparing the specimens with those picked at Wolf-hill," the residence of William Thompson, Esq., and the original Irish locality, " I found them identical, and it strikes me forcibly that I have passed it over in several other glens."

I am not aware of its having hitherto been recorded as inhabiting England or Wales, but Mr. Woodward's herbarium contains a fine specimen gathered by Dr. Forbes Young in a moist wood near Mere clough, by Manchester; and I have no doubt that when the attention of botanists is once called to the subject, it will be found abundantly in all the moist woods of our northern counties.

This species is described by Willdenow, Decandolle, Vaucher, Dietrich, and other authors, as *E. umbrosum*, and by Sir William Hooker and Mr. Babington as *E. Drummondii*. It is well figured by Vaucher† in all its states; the figure in ' Eng-

* Hooker in ' English Botany ' Supp. 2777.

† Mem. de la Soc. de Physique et d'Histoire Naturelle de Genève, vol. i. part 2, pl. iv.

lish Botany' * represents the fertile and barren stems correctly, but neither in the figure nor description do I observe any reference to the combination of fruit and branches on the same stem. Dietrich's figure† has fruit and branches on one stem, but neither separate.

The roots and rhizoma precisely resemble those of the preceding species, the former being small, fibrous, sinuous, often divided, and black; the latter dark brown and striated, and extending horizontally.

The stems are of three kinds—*first*, bearing fructification only; *secondly*, bearing fructification and branches; and *thirdly*, bearing branches only. The fertile stems are four to six inches in height, slightly striated when living, more evidently so when dried; they are of a pale whitish-green colour: the sheaths are very large and loose, and nearly white, in some specimens almost of an ivory whiteness, with a brown ring at the base of the teeth, which are from fifteen to twenty in number, long, almost setiform, *very slightly* flexuous, pale brown, and furnished with dilated, membranous, almost transparent, whitish margins. The catkin is terminal, oval, and of a very pale brown colour; at first it appears sessile, but when mature its footstalk is very obvious: the scales are forty or fifty in number; in figure they are somewhat hexagonal, and have a conspicuous central depression, surrounded by six or seven nearly circular and slightly convex compartments. The catkin is ripe in April.

When the stem bears both fructification and branches, a character overlooked by British botanists in their descriptions, but one of common though not constant occurrence, the branches are disposed in whorls four to six in number, the first being placed at the base of the uppermost sheath, and the others following in succession: the sheaths are smaller than in those stems which are fertile only, and larger than in the barren stems. I am indebted to Mr. Cameron, of the Birmingham Botanic Garden, for specimens in this state, gathered while the catkin was still in perfection.

* Eng. Bot. Sup. 2777.

† Deutschlands Kryptogamische Gewachse, 6, pl. 5.

The barren differs from the exclusively fertile stem in having the sheaths much smaller and more distant; the teeth also are shorter, fewer in number, and less pointed. The barren stem is generally about eighteen inches in length, and is usually divided into about twenty joints, of which the four or five lower ones are branchless, but each of the others is furnished with a whorl of branches varying in number from ten to sixteen in each whorl. These branches at first are somewhat recurved and drooping, as in *E. sylvaticum*, but they afterwards become spreading and slightly ascending; they are simple, and composed of eight or ten joints, of which the basal one is the shortest, being a mere sheath; the second is sinuous: they are usually three-ribbed, and the loose sheath which accompanies each joint terminates in three obtuse teeth, which have the extreme tips brownish; the ribs become diffused, and their integrity lost, before reaching the extremities of the teeth. The ridges of the stem and branches are beset with siliceous points, which give the plant a rougher feel than the preceding.

Sir W. J. Hooker observes—"Its nearest affinity is doubtless with *E. arvense*, but it is abundantly distinct. Its colour is greener and less glaucous; its stem rougher, with closely-set raised points; its angles and branches much more numerous; and the whole barren frond is singularly blunt in its outline or circumscription at the extremity, by which it may be at once known from *E. arvense*. The sheaths, though paler at the base, have blacker and more prominent ribs upwards, and they are so close as almost to imbricate each other. The teeth are also more numerous, when they separate into their proper number."* I quite agree with this profound botanist in considering the present species abundantly distinct from *E. arvense;* indeed the similarity to that plant does not appear to me particularly obvious: my idea of what would be termed "its affinities" will perhaps be sufficiently expressed by my placing it between *E. sylvaticum* and *E. Telmateia*.

* Eng. Bot. Suppl. 2777.

GREAT EQUISETUM, (*fertile stem, natural size*).

EQUISETUM TELMATEIA, Ehrhart.

Equisetum fluviatile, Smith, Hooker, Babington.

THIS beautiful species occurs in almost every county of England, but more abundantly in the neighbourhood of London than in other localities: Hampstead Heath and the neighbouring woods afford several well-known stations: it occurs also in

Scotland and Wales, and Mr. Mackay observes that it is frequent in Ireland. It is apparently common on the continent of Europe, but does not reach the extreme north, not being mentioned by Linneus or Wahlenberg as inhabiting Lapland or Sweden.

Although so common a plant, much difference of opinion appears to prevail respecting the degree of moisture required for its nutriment. Smith very decidedly says, "watery places by the sides of rivers and lakes;" Withering "marshy and watery places, sides of rivers, ditches, pools and lakes;" and Mackay, in the 'Flora Hibernica,' "muddy lakes, sides of rivers and pools, frequent." When lately proposing, in 'The Phytologist,' the change of name for this plant which I have now adopted, I expressed an opinion that its choice of habitat by no means favored the name *fluviatile*, previously applied to it, since it was generally found in "loose gravelly and sandy places, unconnected with water." When this was written I was not aware of a passage in Mr. Francis's 'Analysis of British Ferns,' to which Mr. Gibson has since called the attention of botanists, and which bears directly on the point under consideration; it is as follows. "The name *fluviatile* is not so applicable to this species as it would have been to some others; it is rarely found on the banks of rivers or ponds, nor do I remember ever having seen it growing in the water. It rather affects strong, loamy, damp ground, clayey banks and swampy bogs."* Mr. H. C. Watson, in a succeeding number of 'The Phytologist,'† objects to my view of the subject, and observes, "The finest examples that I have met with were in the counties of Chester and Lancaster, growing on the red marl by the sides of streams, or in water with a deep muddy bottom: indeed it is a notion among the rustics of Cheshire, that horses get 'bogged' by their endeavours to graze on this plant in the muddy pools of that county; and I have certainly seen a horse almost over-head in mud in a small pond filled with the tall 'horse-tails,' which is the name given more particularly to the barren fronds of the present species." Mr. Watson's remarks elicited several replies. Mr. Gibson's was the first of these: he states, "Water or mud is not essential to

* An Analysis of British Ferns, &c. p. 76. † Phytologist, 588.

the growth of *Equisetum fluviatile* [of Smith]. At Broadbank, four miles from Coln, in Lancashire, in a plot of ground which is appropriated to the growth of potatoes, we have the plant growing much higher than the fences. At Midge Hool, near Todmorden, we have it growing very fine in a wood. I have been in the habit of visiting the ponds in Lancashire for the last sixteen years, and never met with it in any of them."* Mr. Luxford, in his 'Reigate Flora,' records a habitat of this plant in these words, "On Reigate hill, south side of Wray lane, far from any water."† In 'The Phytologist,' he further explains that the site is a high mound of loose sandy rubbish which had accumulated at the entrance of a quarry; and adds, "About the year 1836, when I visited Reigate after a few year's absence, I found this mound covered with a most luxuriant crop of *Equisetum fluviatile* [of Smith]. * * * The locality is a very dry one; the nearest water is the large pond in Gatton park, and that is quite half a mile distant."‡ Mr. Ilott having previously recorded, in 'The Phytologist,' a habitat for this species, at Norwood, makes the following observation on the mooted point. "It was growing most plentifully on the steep bank, but much more sparingly on the small piece of wet ground between that and the pond, yet a few stems were found close to the water's edge. There was not, however, a single specimen that actually grew *in* the water. It is worthy of remark, too, that by far the most luxuriant specimens were those which grew on the bank, those about the pond being much more stunted in appearance."§ Mr. Sidebotham says, "About Manchester it is one of our *very common* plants, growing in woods, meadows, and moist gravelly banks, but I never yet met with it *growing in water*. The nearest approach to the latter habitat is in the wood below Arden-hall, Cheshire, where it flourishes in a swamp to the height of six or seven feet."‖

The more closely I investigate the subject the more do I feel strengthened in my original view of the case, confessing, however, that my means of judging are confined to two or three

* Phytologist, 618. † Reigate Flora, p. 89.
‡ Phytologist, 621. § Id. 648. ‖ Id. 649.

localities, of which I select that at Norwood, recorded by Mr. Ilott, as the easiest of reference. The site is the brow of the hill below 'The Woodman' public-house at Norwood, on the road towards Dulwich ; the ground is partially waste, having apparently been excavated for brick-earth, and is sufficiently moist for little pools of water to collect in the hollows ; partially, however, it is cultivated, there being now (August, 1843) a fine crop of wheat ready for the sickle. The Equisetum is abundantly mixed with the wheat in every direction as far as I could see, but its growth is not luxuriant, few of its stems attaining half the height of the wheat, and many falling very far short of even that stature. While this fact, however, proves that it will grow in soil sufficiently dry to produce good wheat, its diminished size affords little evidence on either side, for the constant disturbing of the roots in arable land produces an equally diminishing effect on *E. arvense*, the stems in the hedges, where the roots remain untouched, often attaining a magnitude four times as great as those in the adjacent fields. On the uncultivated land the most luxuriant growth, measuring four feet and a half or five feet in height, was on the banks where all parts of the plant are comparatively free from being disturbed, and the soil loose, loamy and crumbling ; but the approach to the little pools, as well as to exposed dry and trodden parts, was marked by a gradual decrease in the size of the plant, until, in the immediate vicinity of the water and trodden paths, the stems were perfect pigmies, scarcely four inches in height, thus inducing the conclusion that, in this locality, water is prejudicial, if not fatal, to the existence of the plant, and that closeness and compactness of soil is very unfavorable ; a more extensive record of observations is still to be desired.

It is hinted by Haller that the Roman people ate this plant, but the passage is so brief as to throw little light on the subject.*

Considerable difference of opinion appears to prevail on the subject of its being eaten by animals. Mr. Watson, in the passage above cited, states that horses graze on it. Mr. Gibson

* Hoc fuerit Equisetum quod a plebe Romana in cibum recipitur. — Hall. Hist. iii. 1, No. 1675.

says that horses will not eat the plant at all if they can get anything else. On the occasion of my first visit to the Norwood station, there were three half-starved cadger's horses on the waste ground where the Equisetum is growing: they devoured eagerly the coarse sour herbage growing about the pond, and almost every green leaf they could find; indeed it seemed as though they seldom had an opportunity of making a meal, but they pertinaciously refused to touch the Equisetum.

The representations of this plant generally fail to give a correct idea of its figure, from the circumstance that the summit of the stem is alone given; in other respects those in 'English Botany,'* Bolton's 'Filices,'† and Dietrich's 'Cryptogamia of Germany,‡ are tolerably correct.

It has already been shown that the nomenclature of this species is somewhat confused, but I trust that botanists generally will agree with me in restoring the earliest (binominal) name. There is little doubt of its being the *E. majus* of Ray§ and of Gerarde,‖ the *E. Telmateia* of Ehrhart,¶ the *E. eburneum* of Roth,** who himself acknowledges it to be Ehrhart's *E. Telmateia*, and, finally, the *E. fluviatile* of Smith, Hooker and Babington, and of many continental botanists, but I think not of Hudson's 'Flora Anglica,' as cited by Mr. Babington, who, in his zeal to "prevent confusion," has, I fear, indiscreetly added to the confusion already existing.†† Hudson does not seem to have known the plant now under consideration. It also appears clear that it was totally unknown to Linneus, and, consequently, neither named nor alluded to in any of his works. The names given by Ray, Gerarde, and other authors antecedent to Linneus, being dropped by universal consent, we unavoidably arrive at Ehrhart's name of *Telmateia*, published fifty-five years ago. Ehrhart's names were never, I believe, intended by their author as specific names, and, moreover, have been rejected as fanciful by many of our later botanists; but the latter objection scarcely holds good in any instance, and certainly not

* Eng. Bot. 2022. † Bolt. Fil. tab. 36 & 37. ‡ Deut. Krypt. Gew. pl. 5.
§ Ray, Syn. 130. ‖ Ger. Em. 1113. ¶ Ehrh. Beitrage, ii. 159.
** Roth. Catal. i. 129. †† See Manual of British Botany, p. 379.

in the present, for the Greek word τελματειος, signifying 'growing in mud,' is less fanciful, as applied to the present species, than the Latin word *fluviatile*, or 'growing in rivers.' Moreover, the former objection is overruled, in the instance before us, by Ehrhart's name having been employed in the 'Flora Danica,'* a work of acknowledged authority; by Hoffmans, in his 'Deutschlands Flora;'† and recently by Dietrich, as quoted above. I may also add that it is acknowledged as authority by Wahlenberg, than whom we have no more careful or painstaking nomenclaturist.

The roots and rhizoma present no peculiar characters; the latter is generally of an ebony blackness, and seems to spread with considerable rapidity, so that when once introduced a large patch is soon formed.

The stems are of three kinds, as in the preceding species; *first*, bearing fructification only; *secondly*, bearing fructification and branches; and *thirdly*, bearing branches only. The exclusively fertile stems come up in March, shed their seed in April, and disappear in May: at page 67 one of these is represented of the natural size and proportions, and has been divided for more convenient representation: it is nine inches in length, and has six joints, several shorter and subterranean ones having served to unite it with the rhizoma. I have, in some instances, found the total number of joints to be fifteen; the stem, scarcely observable, owing to the great length of the sheaths, is pale brown, smooth and succulent. The sheaths are very large, loose and spreading towards the summit, distinctly striated, and terminate in from thirty to forty long, slightly flexuous, setiform teeth: the sheaths at the base are pale brown, but are much darker towards the summit. The catkin is about two inches and a half in length, and eventually an inch and a half in circumference: the scales are very numerous, often reaching four hundred in number; they are arranged in whorls, of which the lower ones are always sufficiently obvious.

* Flor. Dan. 1469, (on the authority of Smith).

† *E. Telmateia* scapo fructificante dense vaginato, fronde sterili ramoso-verticillata.—Hoff. Deutsch. Flor. ii. 3.

When the stem bears both fructification and branches, it is seldom in perfection until the month of August: such stems are far less numerous than in either of the preceding species, and bear but a small proportion to those which are exclusively fertile or exclusively barren: the catkin is much smaller than under ordinary circumstances: the stem also is smaller, although having longer joints; the sheaths are shorter, less spreading, and of a pale green colour; the branches are placed on the second to the ninth or tenth joint, counting from the catkin; in all the specimens I have seen they are ascending. Several botanists attribute this state of the plant to drought, and Mr. Francis observes that "it may be produced at any time with such cultivated plants as grow in pots, merely by removing the pots from the watery situations in which they are usually placed into a drier spot of ground. Mr. W. Wilson" he continues, "attributes this state of the plant to drought, as here stated, and adds that he has seen a specimen, gathered near Bangor, where this catkin was topped by a prolongation of the branched frond."*

The barren stem is much larger than in any other species of Equisetum with which I am acquainted: it occasionally attains a height of seven feet, and a circumference of more than two inches; its outline and proportions are shown, on a very reduced scale, at page 76, fig. *a*, and one of the internodes, with its accompanying sheaths, is represented of the natural size at fig. *b*.

The following is the description of a living stem now before me, and of the average size. The entire length above ground, and including the ascending branches, is fifty-four inches; the circumference, at twelve inches from the ground, is an inch and a half, but decreases upwards until it becomes extremely slender, terminating almost in a point. The surface of the stem is perfectly without ridges or furrows: the number of joints is forty: the colour of the internodes is white, with the slightest tinge of green, but those on the lower part of the stem often change to intense black: the black makes its first appearance in spots or blotches, giving the stem a singularly variegated appearance; but it rapidly spreads, and finally entirely occupies all

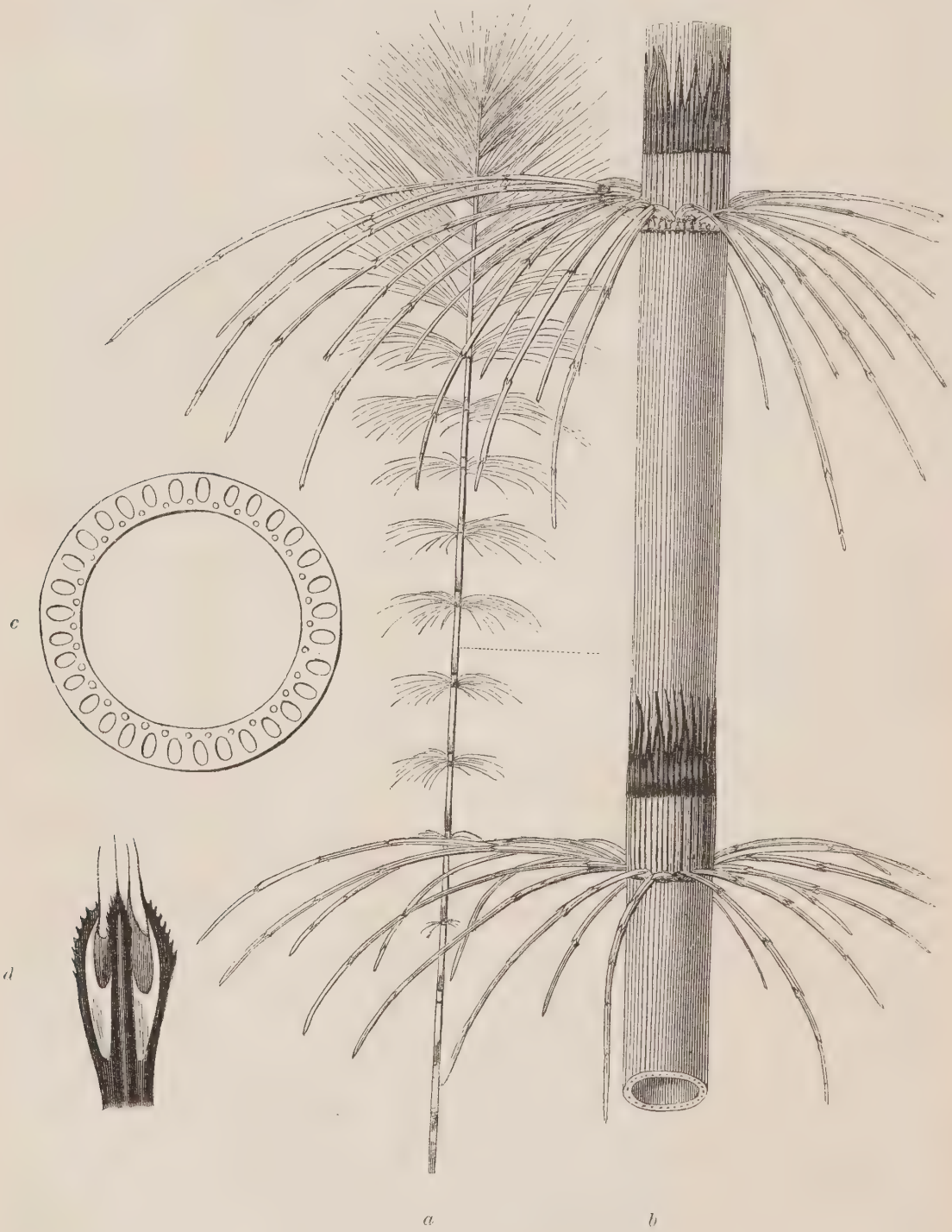
* Analysis, p. 76.

the lower internodes. The sheaths at the stouter parts of the stem are fully half an inch in length, and the teeth are as much more: the former have about thirty-two deep and distinct striæ, which are furnished with rows of siliceous particles at their edges; the spaces between the striæ have broad shallow furrows. The teeth are slender, setiform, closely appressed to the stem, frequently adhering at the summit in twos and threes, and furnished with dilated, semi-membranous, somewhat ragged edges at the base. The sheaths are pale green, with a distinct blackish ring at the summit; the teeth are black, with the membranous edges brown, and, in the lower sheaths, often clothed with a brown, byssoid pubescence. Each of the joints, with the exception of five forming a slender apiculus at the summit, and six nearest the ground, is furnished at the base of its accompanying sheath with a whorl of slender branches: those of the lower sheaths are short and recurved, while those near the summit are nine inches in length, and nearly erect: the varied direction of the branches is shown at fig. *a*. The number of branches in a whorl is very various: the respective numbers, counting from the summit, are these—five, six, seven, eight, nine, ten, thirteen, fourteen, fifteen, sixteen, eighteen, twenty, twenty-five, twenty-nine, thirty-three, repeated eleven times, thirty, twenty-eight, and sixteen, making a total of six hundred and seventy-eight. The colour of the branches is a delicate green, so beautiful as to attract the eye at a considerable distance. Each of these branches is composed of about eight or nine longish joints, and each joint terminates in a loose sheath: the branches have either eight or ten ribs, united in pairs, and rough with siliceous particles: the sheaths terminate in four or five teeth, each furnished at the extremity with a slender black bristle: a pair of ribs ascends into each of the teeth, and each rib is furnished, near its termination, with a series of rather long siliceous points, which give it a pectinated appearance. Such may be received as the description of a stem of normal size and characters, and the variations are very unimportant, chiefly consisting in size and number of branches, but rarely interfering with the figure of the frond, unless caused by circumstances, as excess of wet or drought, both apparently uncongenial to its

perfect development. One character, however, must not be passed over in silence, and that is, the liability of the branches to emit two, three, four, or even five, secondary branches, from the summit of the second joint: these branches are usually slender, and when present they give the plant a beautifully compound and feathery appearance. Sir J. E. Smith describes the branches of this species as four-angled, each angle having a longitudinal furrow, and remarks that this structure was first noticed by Mr. J. D. Sowerby; but the description given by Ehrhart and Roth, in the works previously quoted, appear to me more precise and accurate, and I think must also be of earlier date. Ehrhart describes the branches as "*subquadragenis, octo-sulcatis, sulcis alternis majoribus,*" and Roth uses these words—"*rami * * * octo-sulcati, sulcis alternis profundioribus, hinc tetragoni.*" Both the descriptions are admirably applicable to our British plant, and satisfactorily fix its identity. Although there is some trouble in finding out and deciphering every previous description of a plant, yet an author should do this as far as he can, and the knowledge thus gained will amply repay him. It is my own misfortune to be unable to devote the time requisite for such a delightful labour; and I can seldom give the continental authors of the Linnean school the attentive perusal they deserve, except when a doubtful species or confused synonymy actually enforces the task: but the search on these occasions, limited though it be, never fails to exhibit new causes to admire the skill, patience, accuracy, and profound knowledge exhibited in their careful writings.

The stem presents a transverse section very different from that of any other species: it is represented on the next page, at figure *c*. At figure *d* I have attempted to show the structure of the sheaths of the branches in this species. These sheaths of the branches, secondary sheaths, or *vaginulæ*, as they are termed by Roth and others, are so different in the British Equisetums, that the inspection of a single one is quite sufficient to determine the species; and when specimens have been selected without much care for a herbarium, it not unfrequently happens that no other diagnostic can be consulted. I therefore invite attention to the descriptions which I have drawn up with considerable

care, supposing the part to which I allude to have been rather neglected by many of our authors. The figure of the plant is so protean in the verticillate species, that it is satisfactory to possess so certain a diagnostic as these sheaths afford.



CORN-FIELD EQUISETUM (*natural size*).

EQUISETUM ARVENSE, Linneus.

THIS is, beyond all comparison, the most abundant of our British Equisetums; indeed it is a serious nuisance to the farmer and gardener, whose utmost efforts to eradicate it frequently prove ineffectual. It appears to have little choice of locality, being equally common in dry and moist situations.

The name of this species is now universally received, and I am not aware that any doubt exists as to its being the *Equisetum arvense* of Linneus, although there is some confusion in the nomenclature of the specimens in the Linnean herbarium, as already shown.* The barren stem of this plant is without doubt the '*Equisetum arvense longioribus setis*' of Ray's 'Synopsis,'† and it also seems to me that the '*Equisetum pratense longioribus setis*' of the same work, although added by the careful Dillenius, is the same plant. Still this latter has sometimes been considered distinct as a species, and identical with the continental *E. pratense*, which is so carefully described by Roth,‡ and previously, although not so fully, by Ehrhart.§ Roth, however, admits that he had never seen the catkin, and the circumstance of this being found on a branch-bearing stem forms the chief diagnostic of the species. Willdenow, who describes the species,‖ confesses he has not seen it at all, and almost every other author omits it altogether : thus it appears not improbable that some form of *E. arvense* was the plant originally intended. The '*Equisetum nudum minus basiliense*' of Ray can be none other than the fertile stem of *E. arvense*, as I think is sufficiently proved by the following passage. — "This was first shew'd to Mr. Lawson at Great Salkeld, but grows in so great plenty there and every where on the banks of the River Eden, that he could not but wonder that this was the first time of its being observ'd in England. 'Tis an early and quickly fading Vernal Plant, which might probably be the Occasion of its not being hitherto taken notice of by those curious Gentlemen, who commonly began their Circuits too late in the Year for such a Discovery."¶ The '*Equisetum nudum minus variegatum basiliense*' of Bauhin,** is quoted by Smith as synonymous with his *E. variegatum*, and by Linneus as synonymous with his *E. hyemale*, which

* Appendix C. † Syn. 130.

‡ Roth, Flor. Germ. iii. 6. § Ehrhart, Beitrage, iii. 77, n. 36.

‖ Species Plantarum, v. 6.

¶ Th. Robinson Ess. towards a Natural History of Westm. and Cumberl. p. 92, as quoted in Ray's Synopsis, p. 130.

** Pin. 16, Prodr. 24, Theatr. 250, no f.

plants widely differ from the early disappearing plant described by Mr. Robinson in the passage above cited.

The figures of this very common plant are so different that it seems impossible to reconcile the discrepancy otherwise than by a reference to the protean character of the original: that in Curtis's 'Flora Londinensis'* may perhaps be cited as the best.

The corn-field Equisetum is supposed to be very injurious to cattle; it is, however, most probable that they will not touch it, unless compelled by extreme hunger.

This seems to be the only British species in which the fertile and barren stems are perfectly and constantly distinct, and of a different structure, the former having generally completely vanished long before the latter have acquired their full development. In those species which are normally simple, *i. e.* without whorls of branches, it appears the character of each full-sized and vigorous stem to produce a terminal catkin, consequently there is no observable difference in the structure of the fertile and barren stems: in the following species, *E. palustre* and *E. fluviatile*, the same general character obtains, the grand distinction being in the almost constant presence of whorls of branches: in *E. sylvaticum* a marked difference is observable, for not only are a portion of the stems exclusively fertile and rapidly evanescent, but the *mixed* stems — those which bear both catkin and branches—are decidedly different to the exclusively barren ones, being more succulent, and having larger and looser sheaths: in *E. umbrosum* the discrepancy between fertile and barren stems is so great that the combination of the two, although common, has not been noticed by our British authors: in *E. Telmateia* these mixed stems are comparatively rare exceptions, and have almost been regarded as unnatural or monstrous; so that we arrive, by an almost imperceptible transition, at *E. arvense*, in which the two kinds of stem are perfectly and constantly distinct.

The figure at page 77 represents two stems of the corn-field Equisetum, of the natural size, *a a* being the fertile, *b b* the barren stem: they are drawn from living specimens, and show the

* Curtis, Flor Lond. pl. 285.

immature barren stem synchronous with the perfectly ripe fertile stem, both of them ascending from the same rhizoma; and I may here remark that the appearance of the barren stem at this early period is very similar in *E. sylvaticum*, *umbrosum*, *Telmateia* and *arvense*, so that the figure referred to gives a good idea of them all. The fertile stem, selected for the figure as one of average size and proportions, may be thus described: it is about nine inches in length, and is divided into eight joints, which decrease in length from the catkin downwards: the stem is extremely succulent, of a pale brown colour, smooth and quite without furrows: the sheaths are loose, somewhat gibbous and distinctly ribbed; they are of a pale yellowish brown colour at the base, and have about ten dark brown, long, pointed, teeth: these occasionally adhere at the points in twos and threes.

The catkin is an inch and a quarter in length, rather slender, blunt and rounded at the apex, and stands on a distinct footstalk, usually about equal to half its own length; it is of a pale delicate brown colour, occasionally tinged with rosy red; the scales are very variable in number, being sometimes scarcely a hundred, at others reaching two hundred and fifty. The catkin is mature in May, and sheds abundance of seed of a beautiful green colour.

The following is a description of a barren stem. Length twenty-eight inches; very slender at the summit, and increasing to the size of a goose-quill at the base: the colour is glaucous green towards the summit, and pale green towards the base: the stem has from ten to sixteen distinct but not very deep furrows, and the same number of equally distinct ribs, which are furnished with very minute siliceous points: the number of joints is twenty-one; the length of the internodes varies from half an inch at the summit to two inches at the base: the sheaths, including the teeth, are scarcely more than a quarter of an inch in length; they are but little larger than the stem, not however clasping it so tightly as in *E. fluviatile*: they are furrowed in the same manner as the internodes, but the ribs are double: the teeth are ten to sixteen in number, wedge-shaped, acute, and dark brown or black; they are commonly, but not constantly, furnished with a narrow, brown, marginal membrane: I have

never seen the teeth of this species with the distinct white semi-hyaline membrane, which appears constant in *E. palustre*, *E. umbrosum*, and some other species. There is a whorl of branches on each of the thirteen upper joints, the eight lower ones being branchless: the number of branches in a whorl varies from four to thirteen. The branches are eight to ten inches in length, rather stout, spreading, slightly ascending, four-ribbed and composed of ten or twelve joints, of which the apical ones are shortest; the basal joint is shorter than the three which follow it, but it is much longer than in *E. palustre*, and still more so than in *E. umbrosum:* the short sheath at the base of each branch usually terminates in obtuse brown segments: the other sheaths are loose, and terminate in four long acute teeth, which are generally concolorous throughout, and a single rib invariably ascends undivided to the extreme point of each.

The more strongly marked variations of the barren stem are these.—

A.—Stem erect; branches simple, very rigid, erect, and densely crowded.

B.—Stem erect; branches simple, less rigid, spreading, slightly ascending.

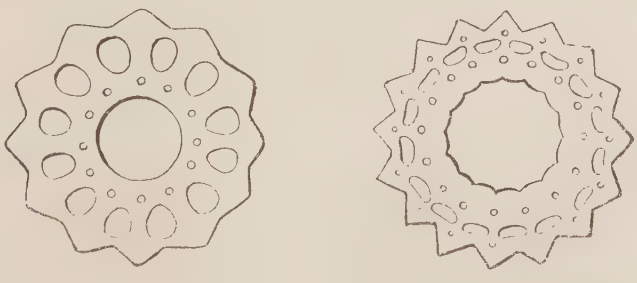
C.—Stem erect; branches simple, gracefully drooping.

D.—Stem erect; branches compound, in the same manner as in *E. sylvaticum*, and gracefully pendulous.

E.—Stem almost prostrate, with semi-erect, very long, compound feeble branches.

F.—Stem prostrate, with scattered, simple, irregular, semi-prostrate branches.

The right hand diagram represents a section of the stem of *E. umbrosum*, the left hand of *E. arvense*.



The diagrams below are intended to give an idea of the barren stems of *E. arvense* and *E. umbrosum :* the left hand figure represents *E. arvense* with drooping and compound branches.

TRUE MAIDENHAIR (*natural size*).
ADIANTUM CAPILLUS-VENERIS, Linneus.

THE true Maidenhair, the only species of the genus *Adiantum* that has been discovered in Britain, is one of our most local and most beautiful ferns: it always occurs in moist caves or the fissures of rocks, near the sea-coast, preferring a perpendicular surface, whence its delicate fronds grow in a nearly horizontal direction, inclining upwards at the extremity.

CORNWALL. — I am indebted to Miss J. M. FOX for a living plant from Carclew, the seat of Sir C. Lemon, where it grows abundantly. Mr. Ralfs informs me he found it on cliffs within reach of the sea-spray, between St. Ives and Hayle; and Mr. H. C. Watson gives me St. Ives as a habitat on the authority of the Rev. J. S. Tozer, and Carrick Gladden—a sea-cave in the same vicinity — on the authority of the Rev. Jas. Harris.

DEVONSHIRE. — I am indebted to Mr. Ward for specimens from the vicinity of Ilfracombe: he found it growing luxuriantly on the face and in the vertical crevice of a rock in White Pebble bay, in a dense mass, which commences at a height of about twenty-five feet, and descends to within about five feet of the level of the sea; he also observed it at Rillidge point, and two

other stations in the same neighbourhood. Mr. Edwin Lees has likewise obligingly sent me specimens from the same localities: he found it in great abundance in September, 1843 : in every instance the fern was growing in gulleys of the cliff, where little rills of fresh water dribble down from above, depositing a travertine sediment. Mr. J. Buckman, of Cheltenham, has kindly transmitted Ilfracombe specimens. I have also to acknowledge my obligation to the Botanical Society of London for specimens from Ilfracombe, collected by Mr. J. E. Gray, of the British Museum. Miss A. Griffiths informs me it has been found at Watermouth, also on the north coast ; and the Rev. W. S. Hore adds that it has lately been discovered near Brinham, on the south coast, by Mr. Bartlett.

Wales.—Miss M. Waring informs me she obtained specimens from rocks at Dunraven, in Glamorganshire ; and Mr. Dillwyn observes that it is common on the cliffs of lias at the eastern end of the county, but that he has not seen it on mountain limestone, or nearer to Swansea than Dunraven.* I have seen specimens from Barry Island, off the same coast, and this, as well as Port Kirig, have been given in all our Floras as localities.

Isle of Man. — We find it mentioned in Lightfoot's 'Flora Scotica' as a native of the Isle of Man, but this locality appears to have been little regarded, indeed it had sunk into oblivion, when we were favored by a corroborative statement of the fact by the Rev. F. F. Clark.† From this gentleman we learn that the locality was rediscovered by Dr. Wood, of Cork, in or about 1809, and by himself in 1835 and 1840 : in the latter year he thought it nearly exterminated, but Mr. T. G. Rylands again observed the plant in Glen Meay, in 1841 : he found young plants in tolerable abundance, mixed with more mature ones, although it required close examination to discover the roots when the fronds were gone ; the finest root was high above a water-fall and perfectly inaccessible, so that he considers its extermination highly improbable. I am indebted to Mr. Wilson for cultivated specimens, from a root brought by Mr. Rylands from this locality.

* Phytologist, 183. † Id. 89.

Scotland. — In Lightfoot's 'Flora Scotica' we find this record: — "Dr. Sibthorpe, the present most obliging Professor of Botany, at Oxford, favored me with the sight of a large and perfect specimen of this fern, in the copious herbarium preserved at the Physic garden in that university, to which specimen a label was annexed, with this inscription, 'From the isle of Arran, near Galloway, from Mr. Stonestreet.' The specimen is to be found among the ferns.—*Lib.* 3, *p.* 3, *f.* 3."* This statement is now universally believed to be an error, and to refer to the isles of Arran near Galway, on the west coast of Ireland. The "banks of the Carron, a rivulet in Kincardineshire," on the authority of Professor Beattie, as recorded by Sir W. J. Hooker, is another station that requires to be verified.

Ireland.—I am indebted to Mr. Mackay, of the College Botanic Garden, for a specimen from the south isles of Arran, where he found it in profusion; and Mr. R. Ball, of Dublin, informs me it is so abundant in this locality, that the poor inhabitants use a decoction of its leaves instead of tea. Mr. W. Andrews found it sparingly on the Cahir Conree mountain, near Tralee; and Mr. J. M'Calla, a most industrious and praiseworthy young botanist, residing at Roundstone, in Cunnemara, found a few plants at the foot of a rock facing south-west, on the banks of Lough Bulard, near Urrisbeg.

The geographical range of the species is very wide, extending over the middle and south of Europe, Asia, the north of Africa, the Canary and Cape de Verd Islands; and forms so similar as scarcely to admit a doubt of their identity, occur in nearly every tropical or temperate country yet visited by botanists.

The figures designed for this plant are for the most part very characteristic: that in Gerarde,† as quoted by Sir J. E. Smith, must, however, be excepted, and I cannot avoid entertaining a doubt as to the fern intended.

Sir J. E. Smith has a remark upon the uses of a species of *Adiantum*, which must be received with great caution: the passage is as follows.—"One species of this genus, *A. pedatum*, is principally used in the south of France to make a syrup, which,

* Lightf. Flora Scotica ii. 679. † Ger. Em. 1143.

being perfumed with orange flowers, is called capillaire, and known by that name throughout Europe as a refreshing beverage when diluted with water."* Now I am not aware that *A. pedatum* has ever been found in Europe; indeed it is entirely absent from Sadler's list,† which was published in 1830, and is the most perfect I have yet seen. From this list it appears that *Capillus-Veneris* is the only species of *Adiantum* hitherto ascertained as an inhabitant of Europe. But even though we admit the existence of an error as regards the species, we still have the statement that this rare plant is employed in the manufacture of capillaire: is not this also very questionable? and does not the supposition originate in the French name of capillaire being applied to the plant as well as the syrup? We are told by Bulliard, in his work on the medicinal plants of France, that it is known in shops under the name of 'Capillaire de Montpellier,' and no mention is made of its use as an ingredient of the syrup called capillaire, though the author adds that it is frequently used in medicine.‡

The medicinal properties of the true Maidenhair have been much extolled. Ray, in his 'History of Plants,'§ gives a very detailed account of its wonderful virtues, and gives it too with all the gravity of implicit faith. His catalogue of diseases curable by preparations of this fern seems to include nearly all the ills that flesh is heir to: for his information on this head, our illustrious countryman acknowledges his obligations to one Dr. Peter Formius, a Frenchman, who really appears to have considered the plant a universal *panacea*. Still older writers also bear testimony to its powers; and Tragus, after enumerating sundry of its virtues, boasts of prudently omitting some of the uses to which it has been applied, as unworthy of Christian men.‖ It must, however, be borne in mind that there is a great want of precision in the distinction of species in most of the earlier works, and that other species, more particularly *Asplenium*

* Eng. Flor. iv. 308. † De Filicibus Veris, &c.—p. 52.

‡ Cette plante est connue dans les boutiques sous le nom de 'Capillaire de Montpellier;' on l'emploie fréquemment en médécin. — *Bulliard, Plantes de France*, tab. 247.

§ Hist. Plant. i. 147. ‖ Tragus, Hieron, 533.

Trichomanes and *A. Ruta-muraria*, were confounded with the present under the common name of *Adiantum*, or, in England, of *Maidenhair;* neither should it be forgotten that the boasted virtues of herbs and simples have, for the most part, proved fictitious, and many of those, once most famous, have fallen into utter disuse.

The roots are wiry, black, and fibrous; the rhizoma, or under-ground stem, black and scaly, and creeping though very slowly: the young fronds make their appearance in May, are fully developed in July, and remain green till the winter: the future divisions of the frond are not apparent on its first expanding; three or five pinnæ only appear, and these, in a few days, become divided into pinnules.

Although the form of the frond has been repeatedly described by botanists in precise terms, it must be considered irregular: the rachis, or principal stem, is throughout naked, shining, and nearly black; the branches, or pinnæ, are alternate, and on these are the pinnules, also alternate, and each on a distinct foot-stalk: botanists describe these pinnules as wedge-shaped, or fan-shaped, but their form is not uniform, and often varies greatly in the same frond. The fronds are generally fertile, the exterior margin of each pinnule being divided into a number of lobes, and the terminal portion of these is bleached, scale-like, reflexed, and bears the capsules of seed in somewhat circular clusters on its internal surface: this reflexed margin, and also the situation of the veins, is shown in the detached pinnule to the left of the cut at page 83: the veins divide frequently, and without regularity, and run into the bleached reflexed portion of the lobe, ceasing before its extreme margin, and each bearing a cluster of capsules at its extremity; this will be seen on reference to the lower figure in the same cut, which represents only one lobe or division of a pinnule: the reflexed portion, turned back, and showing the clusters of capsules, is unshaded. When barren, which occurs but seldom, the margins, instead of being bleached and reflexed, are continued on the same plane as the disk of the pinnule, are sharply serrated (as represented in the annexed figure), and per-

fectly green to the extremity : with this exception, the fertile and barren fronds are similar. When the frond has passed maturity, and approaches decay, the pinnules of this fern fall off like the leaves of phænogamous plants, the rachis remaining bare and leafless, and assuming the appearance of a bunch of strong bristles.

Mr. Ball, of Dublin, pointed out to me a property which this fern possesses, when cultivated on Mr. Ward's plan of checking communication with the outer air by means of a glass cover ;— the lobes of the pinnules become viviparous at the extremities, the seeds actually vegetating while still *in situ*, and the young plants taking root, like parasites, in the substance of the old one : from a specimen, in which this peculiarity was clearly exhibited, I sketched the vignette below.

The figure at page 83 represents a small frond from Ilfracombe, of the natural size : the pinnules are frequently as large as the figure to the left of the same cut.

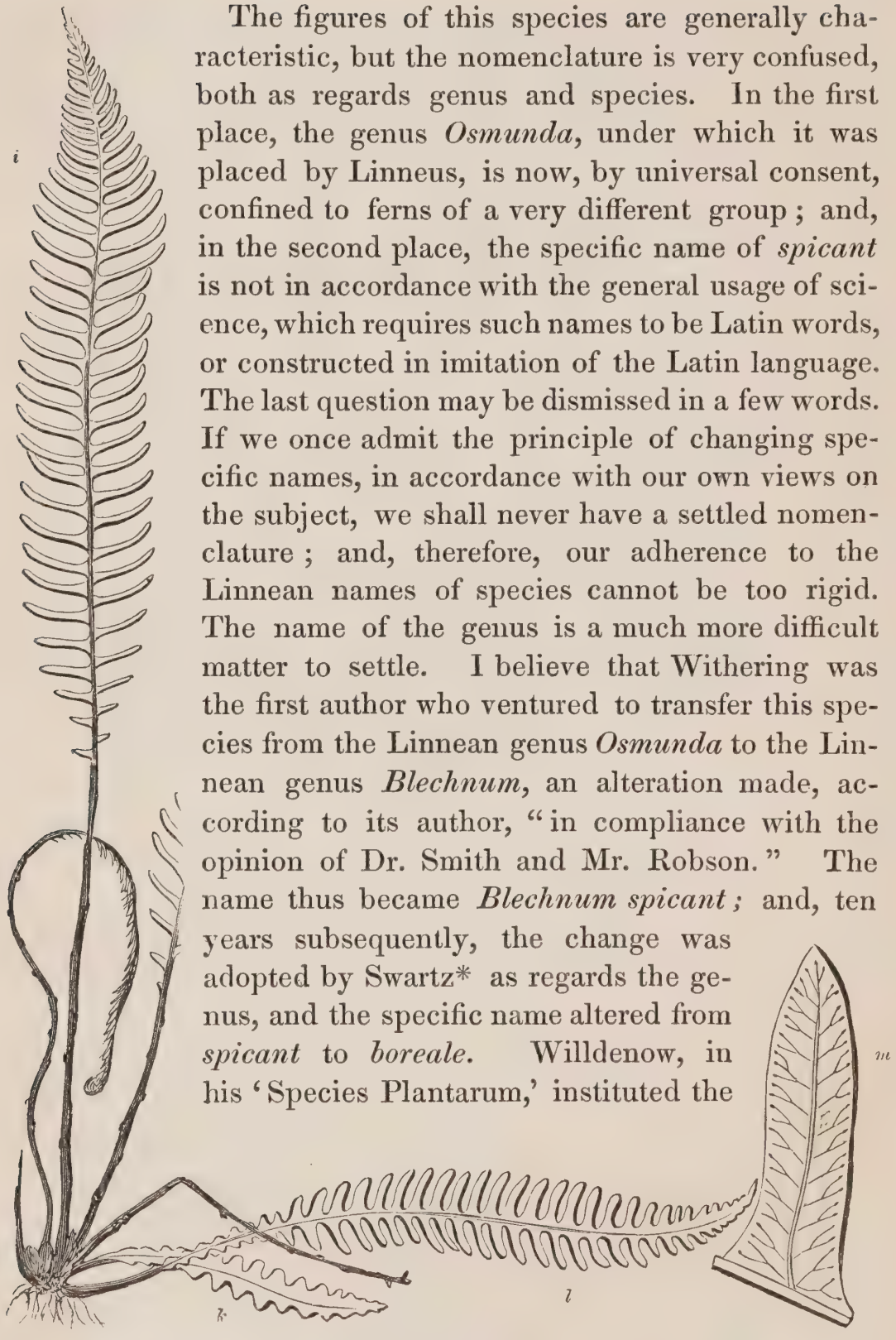
HARD FERN (*one-fifth the natural size*).

LOMARIA SPICANT, Desveux.

Blechnum boreale, Smith, Hooker, Babington.

THE Hard Fern is almost universally distributed throughout the kingdom, in woods, on commons, heaths, and all uncultivated ground: it is fond of moisture, and prefers clayey and gravelly soil: on chalk it is rarely met with. I do not recollect having seen a specimen from the chalk hills of Kent, Sussex or Surrey.

This fern occurs in every European list, and has been found in Northern Africa: it has also been recorded as a native of North America, but I have met with no satisfactory evidence on this subject; and it is absent from collections which have been most obligingly sent me, from different localities, by Mr. Boott, Mr. Lea and Mr. Oakes.



i Fertile frond. *k*, *l*. Barren fronds. *m*. Pinnule of barren frond, showing the venation.

The figures of this species are generally characteristic, but the nomenclature is very confused, both as regards genus and species. In the first place, the genus *Osmunda*, under which it was placed by Linneus, is now, by universal consent, confined to ferns of a very different group; and, in the second place, the specific name of *spicant* is not in accordance with the general usage of science, which requires such names to be Latin words, or constructed in imitation of the Latin language. The last question may be dismissed in a few words. If we once admit the principle of changing specific names, in accordance with our own views on the subject, we shall never have a settled nomenclature; and, therefore, our adherence to the Linnean names of species cannot be too rigid. The name of the genus is a much more difficult matter to settle. I believe that Withering was the first author who ventured to transfer this species from the Linnean genus *Osmunda* to the Linnean genus *Blechnum*, an alteration made, according to its author, "in compliance with the opinion of Dr. Smith and Mr. Robson." The name thus became *Blechnum spicant;* and, ten years subsequently, the change was adopted by Swartz* as regards the genus, and the specific name altered from *spicant* to *boreale*. Willdenow, in his 'Species Plantarum,' instituted the

* Synopsis Filicum (1806), p. 115.

genus *Lomaria*, but retained the present species under the genus *Blechnum*, while Desveux, Presl, Sadler, and other authors of good repute, referred to Willdenow's new genus the species now under consideration, and restored the Linnean name to the species, calling the plant *Lomaria spicant*. Immediately after the publication of my first edition, the same name was published by Mr. J. Smith, in the 'Journal of Botany,'* and it has subsequently been adopted by the compilers of the Edinburgh Catalogue.†

The roots of this fern are black, tough, and wiry; the rhizoma tufted and hairy. The young fronds make their appearance in May; they are of two kinds, fertile and barren: the fertile fronds arrive at perfection in September, shed their seed, and disappear before winter, but the barren fronds continue perfectly green and vigorous throughout the year. The fertile frond, represented of half the natural size by the figure on the preceding page, is erect, linear, simply pinnatifid and pointed at the apex; the lower half of the stem is dark purple, smooth, shining, and naked, but furnished on each side with some minute rudimentary pinnæ, scarcely observable without a close inspection, and having towards the base a few, scattered, long, narrow, and pointed scales; the upper half of the stem has linear, narrow pinnæ, rounded at the apex, convolute at the sides, and densely and completely covered with seed on the inferior surface.

I have to acknowledge the obligations I am under to Miss Beever, of Coniston, for fine Westmoreland specimens of this plant, sparingly fruited, and to Mr. Jenner, of Lewes, for similar Sussex specimens. From these I have been able to learn more of the venation of this species than appeared possible from an examination of the usual densely fruited form. In these specimens the pinnules remain flat, as in the barren fronds, a circumstance which much facilitates the enquiry. The mid-vein of the pinna (*a a a*)‡ is somewhat sinuous, giving off oblique, alternate, lateral veins (*b b b*); these lateral veins are united to each other by what may be termed an irregular longitudinal vein

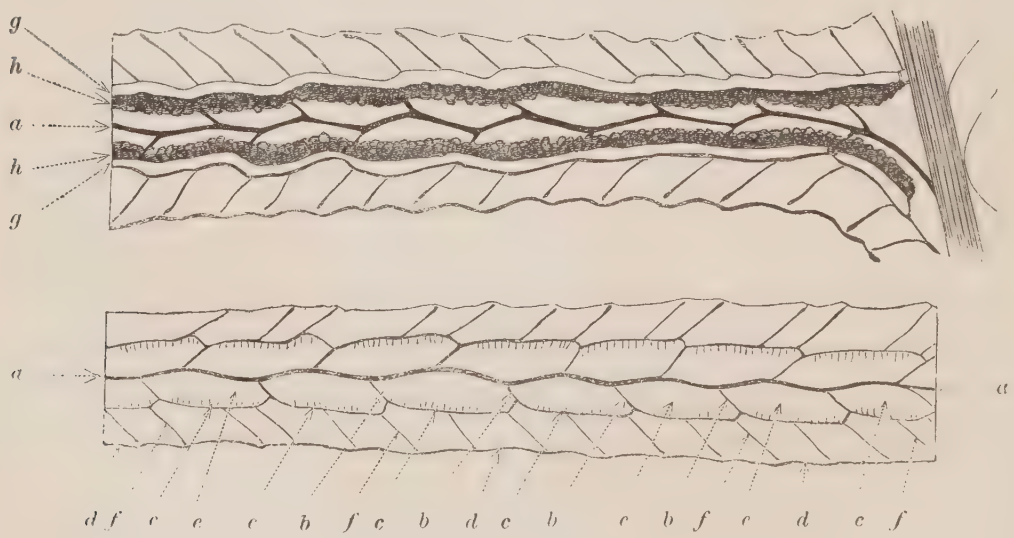
* Journal of Botany, iv. 166.

† A Catalogue of British Plants, &c. Edinburgh, 1841, p. 16.

‡ See wood-cut on next page.

(*c c c*), running parallel with the mid-vein, and nearly equidistant between this and the margin of the pinnæ (*d d d*); the union of the lateral veins causes the formation of a series of what may be termed closed cells (*e e e*); on each side of the mid-vein, from the two longitudinal veins, arise other lateral and slightly capitate veins (*f f f*), which proceed obliquely towards the margin, and terminate just before reaching it; to the two longitudinal veins the capsules are attached, in a continuous series, on that side of each vein which faces the mid-vein; the points of their attachment are indicated in the lower figure, throughout the course of the two longitudinal veins: the capsules are covered by a continuous, linear, white, membranous involucre, which opens towards the mid-vein: these involucres are represented in the upper figure by the white line (*g g*), and the series of capsules appearing beneath them are represented by the black line (*h h*). The fronds from which the descriptions and drawings were made, are so different from the usual state of fertile fronds, that the characters are chiefly valuable as affording a key to the normal venation, which has hitherto almost eluded our enquiries: yet furnished with this key we find that the same structure obtains, in a minor degree, in all the fertile fronds.

The barren fronds are much shorter than the fertile, generally horizontal, strap-shaped and pinnatifid, and have a short portion of the stem, not more than a sixth, naked and slightly scaly.



COMMON BRAKES (*one-tenth the natural size*).
PTERIS AQUILINA, Linneus.

THE common Fern, or Brakes, as it has usually been termed, is the most abundant of our British species: there is scarcely a heath, common, wood, or forest, in any part of the United Kingdom, in which it does not make its appearance: its presence, in great abundance, is said to indicate poverty in the soil, but from its luxuriance when growing in the vegetable mould of woods, and in highly manured gardens, I am inclined to suppose its usual absence from rich cultivated land is rather to be attributed to the effects of the plough and hoe than to any quality of the soil. It is quickly eradicated by either of these instruments, and seems peculiarly susceptible of injury. It appears one of those truly wild plants which fly from man, and take refuge in wastes and wildernesses. In size it is extremely variable; sometimes it is scarcely a foot in height; at others it reaches an altitude of ten and even twelve feet. Although it

occurs on every other description of soil, it avoids chalk, and scarcely a plant can be detected on the South downs of Sussex: in dry gravel it is usually present, but of small size, while in thick shady woods, having a moist and rich soil, it attains an enormous size, and may often be seen climbing up as it were among the lower branches and underwood, resting its delicate pinnules on the little twigs, and hanging gracefully over them; under these circumstances it is a fern of exquisite beauty.

The geographical range of the common Brakes is very extensive it is included in every European list; it occurs also in Asia and Africa. The common *Pteris* of North America is, I believe, generally considered distinct: but there are so many points of resemblance that I am scarcely prepared to coincide in this decision.

The figures of this fern invariably fail to give a correct idea of its appearance, from the difficulty—almost amounting to impossibility—of reducing it to the requisite size.

The Brakes is the *Filix femina* of all our older authors, and the transfer of that name to another species was made by Linneus, who gave the plant now under consideration its present title: however unadvisable the change may have been at the time, it has been generally adopted by subsequent botanists. Presl, in his 'Tentamen Pteridographiæ,'* has revised and divided the genus *Pteris*, referring the present species to Bernhardi's genus *Allosorus:* but in this genus he has included species which scarcely possess a character in common; and moreover, the *Allosori aquilini*, to which division of the genus the Brakes is referred,† constitute the third and not the typical division of the genus, which properly includes the *Allosorus crispus*, a very distinct and different plant. It therefore becomes necessary to institute a new genus for the reception of the *Allosori aquilini* of Presl, or else to restore to them their original generic appellation of *Pteris.* Not feeling competent to the former, I adopt the latter course, hoping that some more profound botanist will, ere long, undertake to classify the heterogeneous contents of this extensive genus.

* Tentamen Pteridographiæ, p. 143 &c. † Id. p. 153.

This is not only the most abundant, but the most useful of our British Ferns. "If cut while green, and left to rot upon the ground, it is a good improver of the land: * * it is an excellent manure for potatoes, and if buried beneath their roots it never fails to produce a good crop: * * it makes a brisk fire for the purposes of brewing and baking. * * In many of the western isles [of Scotland], the people gain a very considerable profit by the sale of the ashes to soap and glass-makers."* Mr. Bladon, of Pont-y-pool, informs us that "in many of the open mountainons parts of Wales, where it grows abundantly, the Brakes is cut down in the summer, and, after being well dried, is burned by the cottagers in large heaps, for the sake of the alkali contained in the ashes: when sufficiently burned, enough water is sprinkled on the ashes to make them adhere together, when they are rolled into round balls, about two inches or two-and-a-half in diameter. These balls are thoroughly dried, and carried about the neighbourhood where they are made, for sale in the markets; and they are also frequently kept by shopkeepers, to supply their customers. The price of these balls varies in different seasons, from 3*d.* to 8*d.* per dozen. They are very much prized by some housewives, for their utility in the wash-house, in economizing the use of soap. When about to be used they are put into the fire, and when heated to a red heat, are taken out and thrown into a tub of water: the water in the course of an hour or so, becomes a strong ley, and is then fit for use."†

As a litter for horses "fern" is in great request in many parts of Wales, Scotland and Ireland. While wandering among the mountains of Wales, I have continually met with sleighs, drawn by a ragged pony, and laden with *Pteris* by an industrious Welshwoman . when thus collected, it is not only used for litter, but is also chopped up when dry, and mixed with straw or hay, and given in the winter to the little horses and mules kept for working on the tram-roads. In Scotland, particularly in the western Highlands, I often noticed it in use as a thatch for cottages; and Lightfoot remarks,—"In Glen Elg, in Invernesshire,

* Lightfoot's Flora Scotica, ii. 658. † Mag. Nat. Hist. n. s. iv. 242.

and other places, we observed that the people thatched their houses with the stalks of this fern, and fastened them down with ropes made either of birch-bark or heath; sometimes they used the whole plant for the same purpose, but that does not make so durable a covering." * The same author goes on to say that swine are fond of the roots if boiled in their wash; and Mr. Edwin Lees has recorded in 'The Phytologist' † that in the forest of Dean he saw some girls carrying a quantity of recently cut *Pteris aquilina* or Farn, which they retailed at twopence per bushel. On enquiring the use for which it was intended, he was informed that it was extensively employed in the forest for feeding pigs, which are very fond of it: for this purpose, however, it must be cut while the fronds are still uncurled, and must be boiled. The slushy or mucilaginous mass thus produced is consigned to the wash-tub or other receptacle, and in this state it will keep as pig-food for a considerable length of time. Mr. Lees was informed that it was found very serviceable, especially to cottagers, as coming in at an early period of the summer, when the produce of the garden is generally scanty. Mr. Lees suggests that it might not be an unpalateable accompaniment to a rasher of bacon, but its use as an article of human sustenance is not quite so questionable as it would be if dependant on this ingenious speculation: we learn from Lightfoot that it has not unfrequently occurred that the poorer inhabitants of some parts of Normandy have been reduced to the miserable necessity of mixing the large and succulent rhizomas of this fern with their bread; and in Siberia, and some other northern countries, the inhabitants brew them in their ale, using one-third of these rhizomas to two-thirds of malt. The ancients also are said to have used both the rhizomas and fronds of this fern in decoctions and diet drinks, in chronic disorders of all kinds, arising from obstructions of the viscera and spleen. Some of

* Lightfoot, Flor. Scot. ii. 659. It would appear that formerly it was commonly used in England, for the same purpose, for by a statute for regulating the price of labour in England, dated 1349, being the 23rd of Edward III., we find it enacted, that every tyler or coverer with straw or fern shall receive 3*d.* per day, and their servants or knaves 2*d.* per day, and their boys 1½*d.* per day.

† Phytologist, 263.

the more modern writers have given it a high character for the same purposes, but it is now falling into disuse among medical practitioners: the country people, however, in Haller's time, still continued to employ it for its ancient uses, and gave it as a powder to destroy worms; they also regarded a bed of the green fronds as a sovereign cure for the rickets in children: probably these uses are still in vogue. Its astringency is so great that it is used in many places abroad in dressing and preparing kid and chamois leather.*

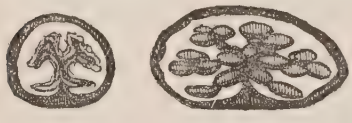
The only British species of *Cicada*, the *C. hæmatodes* of Linneus, is said to feed, in the larva state, on the rhizoma of this fern: in the companion work to the 'History of British Ferns,' I have represented this insect, together with its empty pupa-case, the latter still adhering to the stem of *Pteris aquilina*, in the position in which it has been found in the New Forest, in Hampshire, the only British locality yet discovered for the insect.† The beautiful caterpillar of a British moth (*Mamestra Pisi*) is found in great abundance on the brakes in autumn.

The roots are brown, fibrous, and tomentous. The rhizoma is brown, velvety, and most extensively and rapidly creeping; it generally runs in a nearly horizontal direction, but sometimes dips deeply and almost perpendicularly. When the London and Croydon railway was in progress, I found, in the New Cross cutting, great abundance of these underground stems in a decayed state, some of them extending to a perpendicular depth of fifteen feet. Whenever this fern has stood unmolested for a long series of years, the soil becomes filled with matted masses of these stems. The young fronds make their first appearance in May; they are extremely tender, and the first shoots are almost invariably destroyed by the late frosts of spring; I have seen them cut down to the surface of the ground as late as the 20th of May. The young fronds come up bent or doubled, the leafy portion being pressed against the stem: the cut at page 93 shows a number of young fronds in various stages of deve-

* Nearly the whole of these observations are in Haller's Historia, and Lightfoot's Flora Scotica.

† See Familiar Introduction to the History of Insects, p. 272.

lopment, and also the mode in which they spring from the rhizoma. The portion of the stem below the ground is of a dark brown colour, velvety, and considerably stouter than the portion above ground; it closely resembles the rhizoma in its general appearance. When this incrassated portion of the stem is cut through, either in a direct or oblique direction, the section bears a regular figure, as represented in the annexed cut, the left-hand section being direct, the right hand oblique, This figure is by many said to represent an oak tree, and is called King Charles in the Oak; by others it is supposed to resemble a spread eagle, hence the specific name of *Aquilina*, given by Linneus. We learn from Mr. Francis's 'Analysis of British Ferns,' that this appearance "was a matter of notoriety at a very early period. Thus we find," says that author, "in a most rare little book, entitled 'A Dyalogue or Communycation of two persons devysed or set forth, in the Latin Tonge, by the noble and famous clarke Desiderius Erasmus, intituled, The Pilgrimage of pure Devotion newly translatyd into Englyshe' (no date, supposed to be 1551), is the following curious passage: "Peraventure they ymagyne the symylytude of a tode to be there; evyn as we suppose when we cutte the fearne stalke there to be an egle.'"* The frond is killed by the first frosts of autumn, however slight they may be; it instantly turns to a deep brown colour, but remains perfectly undecayed, and frequently in an erect position, during the whole winter.



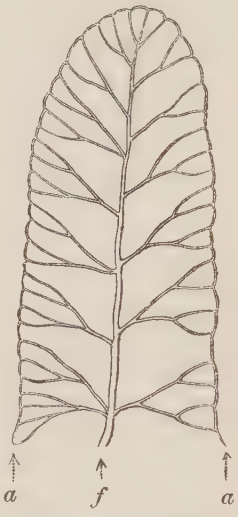
The form of the frond is nearly triangular, the base being somewhat but not materially the shortest of the three sides. The naked portion of the stem is rather more than half the length of the frond, it is green and rather pilose; the pinnæ are pinnate, the pinnules pinnatifid; the lobes are generally rounded and entire, but sometimes again divided; the first superior pinnule on each pinna is usually very small, and, as it were, rudimentary only. The fronds are almost invariably fertile, but all parts of the same frond are not equally so. In seedling plants, or those which occasionally grow in caves, fissures, or on stone

* Analysis, p. 55.

walls, the fronds are smaller, tender, delicate and barren; the margins of the lobes of the pinnules are then flattened, and broadly notched.

Mr. Lees sent me an example of this form, gathered on a wall near Worcester cathedral; Mr. Westcombe another, found on a wall in the centre of the city of Worcester: it occurs commonly on the garden-walls at Deptford; in one instance it has established itself on the brick wall of a house in Union Street, and during the present year, 1843, it has made its appearance upon the wall which separates the Friends' burial-ground from Mr. Hart's garden in High Street: Mr. Woodward's collection contains a fine example, gathered by Mr. Pamplin, at East Grinstead, in Sussex: and Mr. Ewing has observed a solitary plant for many years growing on the wall of the bridge of the castle-moat, Norwich, the fronds varying from three to nine inches in length. In these and other instances, too numerous to mention, the same characters are always preserved.

When fertile, the lobes are incurved or convolute at their edges, and their elasticity is so invincible, that it is very difficult to maintain the lobe in a flat position, adapted for an examination of its fructification. The lateral veins, which are placed either opposite or alternately, are twice dichotomously divided before reaching the margin, where they are united together by means of a marginal vein. The accompanying diagram shows the formula of venation in a lobe which has been flattened for the purpose of exhibiting it more clearly. Attached to the marginal vein, *a a*, and extending throughout its length, is a bleached semihyaline membrane, fringed with a series of jointed capillary segments. Beneath this membrane are the capsules, also attached to the marginal vein, and arranged along it in a continuous linear series, but more abundantly at its points of union with the transverse veins. Again, beneath this linear series of capsules, is a second bleached and fringed membrane very similar to the first. It becomes an interesting question whether both these membranes can be consi-

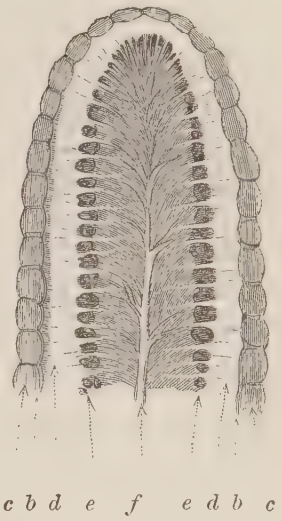


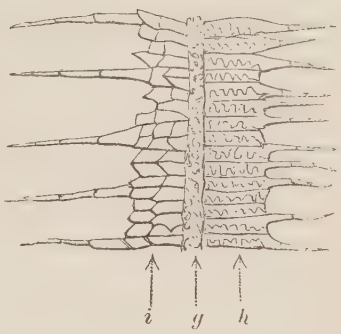
dered analogous to the usual involucre, or one of them only; and if one only, then which are we to select? Roth does not appear to have observed the inferior membrane, but describes the superior one as an involucre originating in an elongated epidermis.* Sir J. E. Smith, although aware of this inner membrane, unhesitatingly speaks of the outer one as the *cover*.† Mr. Wilson, who has most obligingly favoured me with many valuable observations on this remarkable structure, seems to regard the inferior membrane as the involucre; the occasional presence of the superior membrane in the total absence of capsules, proving, in his opinion, that it is not necessarily connected with fructification. Still, although I may state that I do not detect its presence in seedling or barren plants, and am therefore led in a measure to associate its appearance *at least with the power of producing fruit*, yet I am quite inclined to consider it distinct from a true involucre, and more analogous to the inflexed portion of the pinnule in *Adiantum* and *Allosorus*, which, although considered an involucre by Sir J. E. Smith, and all our more eminent authorities, and although there can be no question that its presence is connected with fructification, since in both these instances it is absent when the frond or pinnule is entirely barren, yet I have always regarded as perfectly distinct: instances however occur, in all the genera here cited, in which this inflexed or folded margin of the pinnule is totally unaccompanied by the presence of capsules, as pointed out to me in *Pteris* by Mr. Wilson. Mr. Jenner, who has most obligingly taken the greatest pains to assist me in the enquiry, as regards *Pteris*, also appears to consider the exterior membrane as nothing more than a prolongation of the outer epidermis. The question as regards the interior membrane seems much more restricted: we are compelled to regard this as an involucre, from the absolute absence of any other analogous part to which, with any show of plausibility, it can possibly be referred. I have stated that the margins of each lobe are convolute, so that the marginal vein and its

* Involucrum in plantis hujus generis ortum suum trahit ex epidermide elongata, &c.—Roth, Flor. Germ. iii. 42.

† Eng. Flor. iv. 304.

accompanying membranes, together with the series of capsules between, are bent over towards the midvein, presenting an appearance which I have attempted to represent in the accompanying figure of the under surface of the apex of a lobe: *b b* is the marginal vein in its natural position; *c c*, the inflexed or convolute portion of the leaf; *d d* the superior membrane partially covering the capsules, which are shown at *e e* projecting from beneath it; *f* is the midvein of the lobe. The inferior membrane, although very similar to the superior, has some points of difference; each consists of a disk divided into cells, and a marginal fringe of jointed hairs or capillary segments, but the disk is somewhat differently marked. Mr. Jenner has taken great pains to obtain a view of both the membranes at once, and has favoured me with the annexed sketch, the accuracy of which I have tested by examination. The marginal vein of the lobe is supposed to be presented to view edgeways at *g*, the capsules having been removed, in order to leave the view of the membranes unobstructed; *h* represents the superior, and *i* the inferior membrane.





It is highly probable that the great discrepancy between the species of *Pteris*, as regards their mode of fructification, will eventually induce a more precise and natural grouping than any we are at present acquainted with. It seems to me that in this, as in other instances among the ferns, a single character has been somewhat arbitrarily selected, and considered of paramount importance, while the combination of other characters—for instance, those of habit, figure or texture—have been too much disregarded. The present work purposes to be a history of species, and it would be altogether foreign to such a purpose to make it an essay on classification, yet I cannot with fairness to myself entirely withhold my opinion that the very basis of the classification of

ferns, as generally adopted, is artificial. It is, however, with great pleasure that I observe some of our authors endeavouring to emancipate it from the thraldom thus imposed, and venturing an appeal to Nature. Presl, on the continent, has taken the lead in this honourable task, and I could wish that his accuracy equalled his sagacity; but there are so many and such striking instances of carelessness in his 'Tentamen Pteridographiæ,' that the cause of truth and nature will, I fear, scarcely reap that benefit from his labours which ought to result from the exposition of such luminous ideas. In our own country, Mr. John Smith, of Kew, has laboured in the same field with no less zeal and much more care. From the labours of both these authors much greater advantages are to be anticipated than any we have yet received. From conversation with Mr. Smith I learn far more than from his published works: all his views are characterized by a desire to make artificial give way to natural characters, and to reject all association of species when not plainly existent in Nature; in fact, to follow Nature rather than to lead her.

ROCK BRAKES (*half the natural size*).

Allosorus crispus, Bernhardi, Babington.

Pteris crispa, Smith.

Cryptogramma crispa, Hooker.

The Rock Brakes, Rock Parsley, or Parsley-leaved Fern, is a small plant, generally varying between four and eight inches in length: where abundant, its bright green fronds form a cheerful and pleasing contrast to the dark masses of weather-beaten and lichen-stained rock, by which it is almost invariably surrounded. Although it occasionally condescends to seek a shelter in the crevices of old walls, its favorite dwelling-place is among the shapeless masses of stone which are often strewn in such wild profusion down the sides of our mountains. It is a local plant, and the north of England seems to be its favorite station. I have given below a summary of the English and Welch counties where it occurs, and by this it will be seen that it is entirely absent from the south-eastern districts.

Caernarvonshire. — On nearly all the Caernarvonshire hills this fern appears in small quantities, and occupies a considerable range as regards elevation : it occurs in the interstices of stone walls, between the lakes of Llanberis and the town of Caernarvon, at a very slight elevation above the level of the sea, and ascends to the very summit of Snowdon, Glyder, and the neighbouring heights, 3500 feet and upwards.

Cheshire. — We find it recorded in the 'Botanist's Guide,' on the authority of Mr. Bradbury, as occurring on the top of Tag's Ness, a hill near Macclesfield.

Cumberland. — Mr. Watson and Mr. Pinder have found this fern, in some abundance, on the slate mountains of Cumberland. Mr. Watson observed it on the summits of Scawfell Pikes, Helvellyn, Skiddaw, and other hills near Keswick, as well as in various less elevated spots. It occurs also in Martindale, Borrowdale, &c.

Denbighshire.—Found by Mr. Griffiths, about Cerig-y-Druidion.—*Botanist's Guide.*

Derbyshire. — Found by Mr. Howard, on Chinley hills, near Chapel-le-Firth.—*Botanist's Guide.*

Durham.—Mr. Babington informs me he found it in the Durham part of Teesdale. Rocks at Cocken, and walls near Cronkley fell, are given as habitats in the 'Botanist's Guide.'

Lancashire.—Very abundant in several localities. Mr. Simpson has observed it on moors near Lancaster, at a very slight elevation ; Mr. Wilson found it in the same neighbourhood, on the way to the asylum ; Mr. Pinder and Miss Beever on the Old Man mountain, Coniston ; Messrs. Gibson, Leyland and Gutch, have collected it at Cliviger, near Todmorden ; Mr. Sidebotham and Dr. Wood at Fo-edge, near Bury.

Merionethshire.—I found it sparingly in a loose stone wall, almost close to the town of Dolgelly, and more abundantly near the summit of Cader Idris.

Montgomeryshire. — Found on Breidda hills, by Mr. Aiken. —*Botanist's Guide.*

Northumberland.—Mr. Winch found it abundantly on Cheviot and at the south-west end of Crag lake : specimens are preserved in his herbarium, now in possession of the Linnean Society.

SHROPSHIRE.—Messrs. Cameron, Westcott, Westcombe, Burlingham, and Southall, have found it on the Titterstone Clee hill.

SOMERSETSHIRE.—I am indebted to Mr. Ward for a specimen found by his son in 1840: the plant grows very sparingly on a stone wall, about a mile from Simmonsbath, in company with *Polytrichum alpinum*.

WESTMORELAND.—Miss Beever informs me that it occurs plentifully near Ambleside; Mr. Pinder has found it abundantly on the schist or slate rocks; Mr. Hindson gives me Casterton and Old Hutton as habitats; and Mr. S. Thompson informs me it was observed by Mr. Coventry at Morland.

WORCESTERSHIRE. — Found by Mr. Lees, sparingly, on the Herefordshire Beacon, Malvern hills, but in one place only, and this is on the eastern or Worcestershire side of the Beacon.

YORKSHIRE.—Fountain's fell, found by Mr. S. Gibson, and many other botanists; Haworth, near Halifax; Wensley dale; Cronkley scar; several stations in Teesdale; Ingleborough; Penhill; Settle, and many other localities, are recorded.

In Scotland it appears to be widely, but sparingly, distributed; a few localities are subjoined.

ABERDEENSHIRE.—Mountains near Castleton.—*Mr. Watson.*

ARGYLESHIRE.—I found it in several localities, sparingly.

DUMBARTONSHIRE. —I first found this species near the inn at Tarbet, on Loch Lomond, at a very low elevation.

DUMFRIESSHIRE.—Mr. Babington found it at Jardine hall, the seat of Sir William Jardine: Mr. Cruickshank informs me that it occurs on loose stone walls near George Town, Queensbury hill and Rae hills, and in several other parts of the county, but never in any abundance.

FORFARSHIRE.—Mr. Watson found it on the Clova mountains; Mr. Croall and Mr. Stables on the same range.

INVERNESSHIRE. — Mr. Watson observed it on Ben Aulder, near Dalwhinnie, and on Ben Nevis.

KIRKCUDBRIGHTSHIRE.—Mr. Cruickshank finds it on the summit of Criffel, 1895 feet above the level of the sea.

PERTHSHIRE.—Mr. Gourlie finds it occasionally on the mountains of Perthshire, as Maelronchler, Ben Lawers, &c. I observed it on stone walls near Killin, and in many other places.

Rosshire.—Mr. Watson gives this county on the authority of Mr. Wilson.

Sutherland.—Mr. Francis gives Sutherland on the authority of Dr. Murray.

In Ireland it is a plant of great rarity, occurring very sparingly, and only in three counties which approach those English counties, in which it is most abundant.

Antrim.—Mr. Moore informs me he found a few specimens in the liberties of Carrickfergus.

Down.—Mr. Thompson informs me it was found in the crevices of the rocks about the summit of Sleive Bignian, on the 20th of August, 1808, by the late Mr. Templeton, Mr. Mackay, and Dr. W. Stokes: it is said, in the 'Flora Hibernica,' to be abundant on the Mourne mountains, but this seems scarcely correct: many botanists have been unsuccessful in their search for it, and Mr. Thompson says that after spending ten hours on these mountains he could not find a specimen of *Allosorus*.

Louth.—Mr. Thompson informs me that in 1836 he obtained a single specimen on Carlingford mountain, in this county.

It has not been observed in Orkney by Mr. Clouston, or in Shetland by Mr. Edmonston.

The geographical range of *Allosorus crispus* is confined to Europe, as far as my information has hitherto extended: it appears to occur here and there throughout the continent: it is recorded as a native of Sweden, Germany, Hungary, France, Italy and Spain. I have seen no corresponding form from North America.

Many characteristic figures of the Rock Parsley may be referred to; those in Bolton's 'Filices,' * 'Flora Danica,' † and 'English Botany,' ‡ are very like the plant. Our old friend, Gerarde, the herbalist, appears to have omitted it altogether, but Ray has described it as '*Adiantum album crispum alpinum*.'§

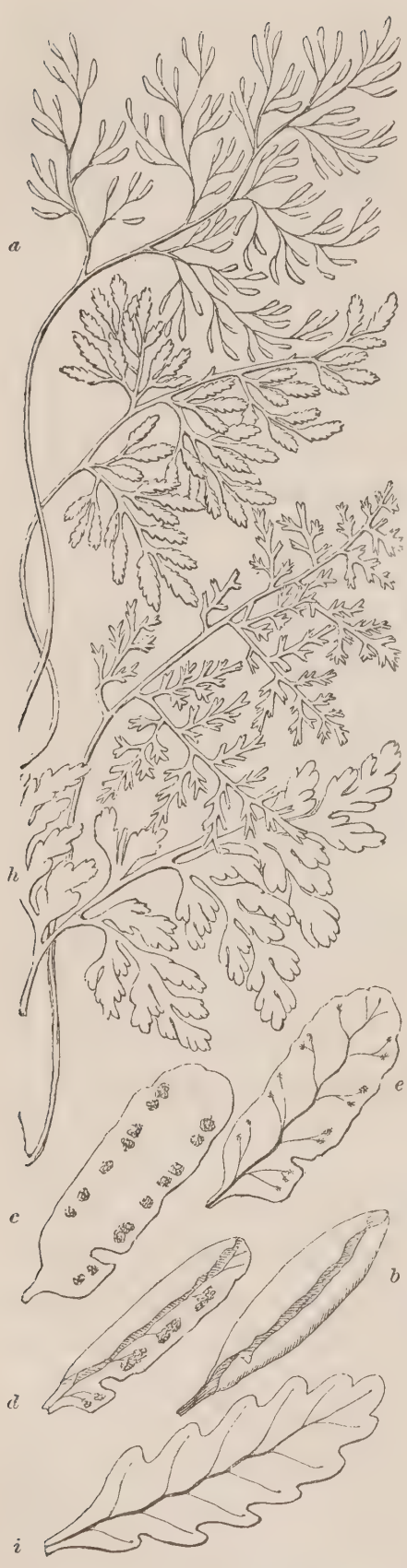
This species appears to have perplexed botanists greatly, as to the genus in which it ought to be placed: Linneus made it an *Osmunda*, but in a MS. note to his own 'Species Plantarum' he transfers it to *Pteris*; our British authors, Hudson, Lightfoot, Bolton, and Berkenhout, follow him in his first nomenclature;

* Bolt. Fil tab. 7. † Flor. Dan. t. 496. ‡ Eng. Bot. t. 1160. § Syn. 126.

Withering and Smith in his second. Roth makes it an *Onoclea*, associating it with *O. Struthiopteris*, the *Struthiopteris germanica* of later writers. By three eminent botanists it has been made the type of a new genus, viz., by Bernhardi, under the name of *Allosorus;* by Desveux, under the name *Phorobolus;* and by Robert Brown, under the name *Cryptogramma*. Of these three names, *Allosorus* has been adopted on the ground of priority, by Sprengel, George Don (in Loudon's 'Hortus Britannicus'), Sadler, Presl, the compilers of the 'Edinburgh Catalogue,' and Babington; and *Cryptogramma* by Hooker and Mackay. The principal characters by which to distinguish this plant from our other British Polypodies, are that its fronds are both barren and fertile, and that the margins of the pinnules in the fertile frond are inflexed or convolute, covering the clusters of capsules. Mr. Gibson objects to the first of these characters; and I have to acknowledge my obligation to him, as well as to Miss Beever and Mr. Cruickshank, for fronds partially fruitful and partially barren. Mr. Gibson objects to the view I take of this character, on the ground of what he considers its inconstancy; but with great deference to the opinion of so excellent a botanist, I must acknowledge that I still continue to regard the fertile and barren fronds of the Rock Brakes as perfectly distinct: in the British ferns, *Lomaria spicant*, *Allosorus crispus*, and *Lastræa Thelypteris*, we observe a marked and constant difference between the two kinds of fronds, whereas in all our other species the want of fruit is the result of immaturity, uncongenial situation, or some other casualty. I will not contend that such a character is sufficient for the establishment of a genus, but that it is one of great interest, and not to be neglected on the ground that an intermediate and somewhat monstrous production may be occasionally found. Still, as regards the genus, the present species is in every respect a *Polypodium*, even as restricted by Presl's description in his recent work,* and his figure of the venation of this species† appears to me incorrect.

The roots are fibrous, numerous, tough, and adhere tenaciously to the earth or stones: the rhizoma is procumbent, extending

* Tentamen Pteridographiæ, p. 176. † l. c. tab. 26, f. 3.



itself horizontally, and producing a constant succession of fronds from its crown. This procumbent or horizontal position appears to me rather the result of age, or want of power to maintain an erect position, than of a tendency to a creeping habit, as supposed by Sir J. E. Smith.* The fronds rise in May and June, and disappear at the commencement of winter: as before stated, they are of two kinds, fertile and barren, both of which are nearly triangular in form, and, like the frond of *Adiantum Capillus-Veneris,* composed of numerous, leaf-like, ultimate divisions: the pinnæ, pinnules, and ultimate divisions, are arranged alternately: the stem is slender, smooth, pale green, and generally much longer than the frond, which is of a bright and delicate green colour. The ultimate divisions of the fertile fronds are of a somewhat oval form, and stand on distinct petioles, as shown at figure *a;* their margins are inflexed or convolute, attenuated and bleached: figure *b* is a magnified representation of one of these little leaves, with its margins rolled over as in a state of nature. The mid-vein is flexuous, and bears eight or ten lateral veins, placed alternately: these are divided shortly after leaving the mid-vein, and each branch bears a nearly circular cluster of capsules, at or very near its extremity which does not quite reach

* "Root moderately creeping."—Eng. Flor. iv. 306.

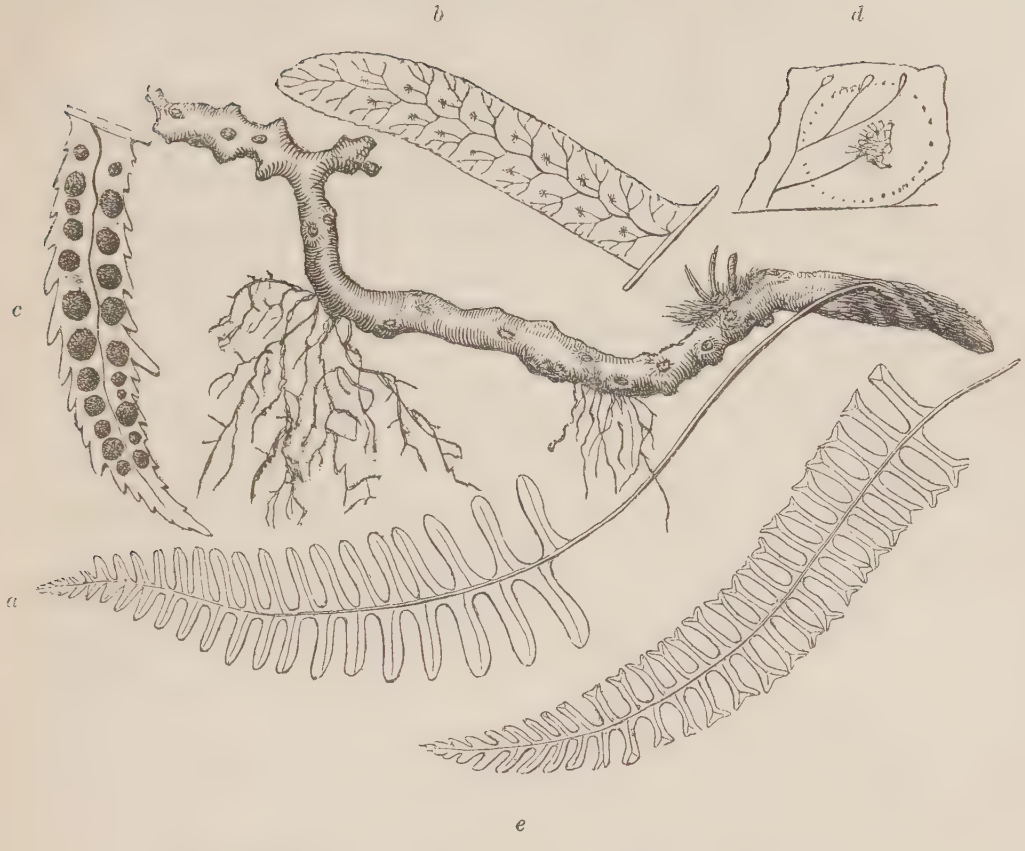
the margin. The little leaves are frequently auricled near the footstalk on one side only; this is shown in figures *c*, *d* and *e*: *c* represents the margins as flattened, and the clusters of capsules consequently uncovered; at *d* the margin is flattened on one side only; at *e* both margins are flattened, the capsules removed, and only the points of their attachments indicated, together with the veins on which they are placed. The character of the barren frond is very various: its appearance is generally crowded and crisped like the leaves of parsley, but its ultimate divisions are much the same with those of the fertile frond. Three forms of the barren frond are represented at *f*, *g* and *h*; all these are of common occurrence: in *f* the ultimate divisions are formed like little oak leaves; the venation of one of these magnified is shown at figure *i*: *g* represents a frond in which the ultimate divisions are nearly linear: I have frequently received this as *Cystopteris alpina;* indeed from what I have seen in various herbaria, I am inclined to think it is the usual representative of that plant: *h* is a form of less common occurrence, yet rarely absent where the plant is growing in considerable quantities.

I was not aware, when publishing my first edition, that I had been so completely forestalled by Roth in my view of the fructification of this plant.* He has described it under the name of *Onoclea crispa*, and has defined, with his usual clearness and accuracy, the peculiarities of its fructification; still I cannot but regard his making it an *Onoclea* as somewhat of an error in judgment, though perhaps pardonable, when we reflect that it originated more in his invincible dislike to encumber the science with new names, than from a conviction that our plant is at all nearly related to the giant *Struthiopteris*. It appears, however, from an observation following his description, that he felt considerable inclination to refer the plant to the genus *Polypodium*,

* Propter fructificationum glomerulos ante maturitatem ad versum foliolorum marginem solitarios, Polypodii speciem refert primo intuitu hæc planta, quæ maturis et effusis capsulis demum confluentibus Pteridem mentitur. At si foliolorum crenulas revolutas et glomerulum suum capsularum tegentes respicias ad Onocleam potius pertinere videtur.—Roth, Flor. Germ. iii. 40.

and he speaks of its similarity to *Pteris* as deceptive. I need make no apology for having introduced his interesting observation as a foot-note (see p. 109), and I may observe that the genus *Onoclea* is now generally restricted to the beautiful *Onoclea sensibilis* of North America.

The vignette below refers to the next rather than the present species; it represents the Common Polypody in a favorite station, one of those decaying stumps over which its creeping rhizoma delights to wander. In the south-west of England it ascends the loftiest trees, and in Epping forest I have often seen it ornamenting, with its bright green fronds, the heads of the pollard horn-beams, when the wintry blast has stripped them of their summer verdure.



POLYPODY, (*one fourth the natural size*).

POLYPODIUM VULGARE, Linneus.

THE common Polypody is one of our best known and most abundant ferns; it is to be found in almost every hedge. It abounds on stone walls and decaying trees, and on the surface of weather-beaten rocks, quickly succeeding the mosses and lichens which first establish a footing in these situations.

Its geographical range is very extensive: it is present in every European list, and occurs in various parts of Asia and Africa. The North-American plant known by the same name, presents a slight difference in the venation, the number of branches in the lateral veins being two or three, instead of four; some authors consider this plant distinct, others look upon it as identical with the European species: I incline to agree with the latter.

The figures of this fern are generally very excellent: good ones are so numerous that I scarcely know which to select for notice. None surpass in fidelity those by Gerarde of the usual

form.* The Linnean name of *Polypodium vulgare* appears to have been universally adopted.

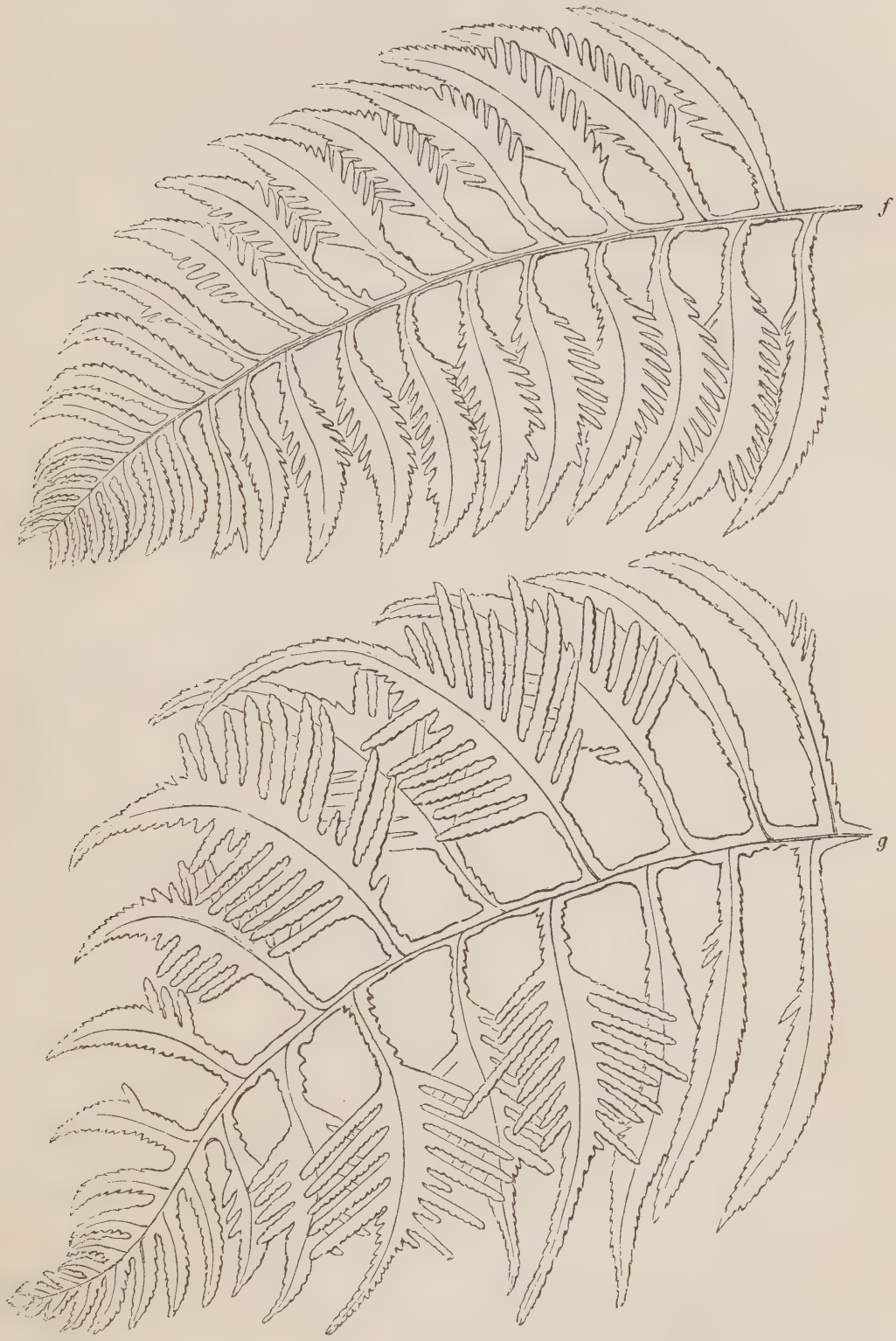
The medicinal properties of the common Polypody were once highly extolled, but the plant is now fast falling into disrepute among medical men: a mucilaginous decoction of its fronds was formerly very commonly administered to children, as a cure for worms, colds, and the hooping-cough; and I have seen elderly women collecting it in Herefordshire, as a specific against the latter disease: it is gathered in October and November, when full of seed, the barren fronds being rejected; it is hung up in the cottage to dry, and when required for use is slowly boiled with coarse raw sugar. It is called by these gatherers Golden locks, and Golden Maiden-hair.

The roots are brown, and often clothed with a thick pilosity. The rhizoma is brown, and entirely covered with a densely pilose cuticle, which dries and peels off after one year's growth, leaving the rhizoma smooth; it is decidedly creeping, making annual advances of considerable extent. The young fronds are thrown out in May and June; they arrive at maturity early in September, and retain their full vigour until the fronds of the succeeding year make their appearance. The young fronds are generally erect at first, but droop by degrees, and are always pendent when mature: the stem is green, and nearly equals the frond in length; the form of the frond is strap-shaped and pinnatifid, and acute at the apex, (fig. *a*); the pinnæ are nearly linear, and rounded at the apex, their margins are more or less serrated. The usual size is shown by the detached pinnæ, represented in the preceding page, (figs. *b* and *c*). The fronds are fertile only, and the clusters of capsules are generally confined to the upper part of each: when without fruit, the imperfection arises from uncongenial situation, and the plant is not to be considered in a perfectly natural and healthy state.

The situation of the veins is shown in the detached pinna (fig. *c*): the lateral veins are alternate, and each is divided into four branches, three of which extend nearly to the margin, and are incrassated at their termination; the fourth is directed forwards,

* Ger. Em. 1132, both figures.

and its termination, which is nearly equidistant from the mid-



vein and margin, bears a circular cluster of capsules, which is entirely without an involucre. A single lateral vein, its four

branches, the attachment of the capsules, and the extent of the circular cluster, indicated by a dotted line, are shown at fig. *d*.

In form of frond the Common Polypody is tolerably uniform; it is however subject to a few variations, some of which are remarkable; the detached pinna bearing the clusters of capsules (fig. *c*) shows a strongly serrated variety, and the entire frond (fig. *e*) has the termination of the pinnæ bifid. Another variety, which is perfectly barren, is so strongly serrated, that Linneus considered it a distinct species, and described it under the name of *Polypodium Cambricum:* the identical frond, named and described by that great naturalist, is now in the possession of the Linnean Society of London. Figure *f*, on the preceding page, is a careful representation of this frond. I have never been successful in my search for this form of the Common Polypody in *Wales*, but have seen in many botanic gardens fine *Irish* specimens, and am indebted to Mr. Moore of the Dublin Glasnevin garden, for a root found in the county Wicklow many years since: it is still in full vigour, and its remarkable character is perfectly unchanged by cultivation; Mr. Thompson, of Belfast, informs me that it was found by the late Mr. Templeton, in a glen at Red hall, near Carrickfergus, county Antrim. Figure *g* represents a still more remarkable variety, found by Mr. Mackay, in the Dargle, in the county Wicklow; the frond represented was sent by Mr. Mackay to the late Sir J. E. Smith, and is also in the possession of the Linnean Society: it differs from the preceding variety in being fertile.

In Ireland this species is much more subject to vary than in England. I have gathered a number of fronds in various parts of the county Kerry, which bear some slight resemblance to Mr. Mackay's beautiful variety; in those districts the frond is also much larger and wider, and grows with greater luxuriance. I must not, however, omit to record my thanks to Dr. Greville for a gigantic English specimen, gathered at Sidmouth; to Mr. Jenner for another gathered in Kent; and to Mr. W. Southall, jun., for others, deeply serrated, gathered in a lane at Moseley, near Birmingham.

BEECH FERN, (*young fronds of the natural size*).

POLYPODIUM PHEGOPTERIS, Linneus.

THE Beech Fern is one of our most beautiful species, and seems particularly fond of wild and mountainous countries, wet woods and the vicinity of waterfalls. I have found its rhizoma in such situations, either abundantly intermingled with mosses, on the face of some constantly moistened rock, or creeping

among the decaying leaves and twigs which form the covering of the ground in woods and forests.

In England and Wales it occurs in the most northern, most western, and most southern counties, but appears entirely absent from a large eastern and midland tract, of which Bedfordshire may be considered the centre. Its range of elevation is very considerable, occupying at least 2500 feet. I subjoin the more interesting or abundant localities.

Brecknockshire. — Mr. Ralfs considers the Beech Fern as common in this county: Mr. Lees informs me he found it in the wood on the left bank of the stream near the waterfall at Pont Henryd, near Capel Colboen. Mr. Dillwyn observed it at Uscoed Hendry and Uscoed Eynon Gam, as recorded in the 'Phytologist,' p. 182, and Mr. Westcombe has found it in many localities about the Black mountains, the Brecon beacon and Chapel-y-Fyn.

Caermarthenshire.—Mr. Lees found it just below the waterfall at Glynhir near Llandebie.

Caernarvonshire. — I have seen it at Aberglaslyn, Beddgelert, Rhaidr-y-Wenol, Falls of Lugwy, Capel Curig, Llanberis, Twll du, Falls of Ogwen, Carnedd David, Bangor, and in many other localities: it is abundant and almost continuous upon a wall to the right of the road between Llyn Gwynant and the Pass of Llanberis: my correspondents have supplied me with a great number of stations in addition to these; and it may be considered a common fern throughout the county.

Cheshire.—Mr. Pinder informs me he found it at Mow-cop, in this county; and Mr. Sidebotham at Werneth. Early-banks wood near Staley bridge, is recorded as a habitat in the 'Botanist's Guide,' on the authority of Mr. Bradbury.

Cardiganshire.—I found it abundantly in the Devil's bridge district, and near Hafod.

Cornwall. — Mr. Borrer informs me he found it not far from Tintagel, on the road towards Camelford.

Cumberland.—A common fern in this county. Mr. Pinder has found it abundantly in Wasdale, Borrowdale, Ennerdale, and on Honister Red pike, Scaw fell, Screes, &c., often at the very summits of the mountains: it has been observed by several

botanists about Keswick, at the waterfall of Lodore, and other localities: Mr. Heysham finds it on moist shady rocks in Newbiggin wood, Baron wood, Gelt quarries, and on the banks of small streams on Tindall fell.

Derbyshire.—Dr. Wood informs me it grows in profusion on the limestone rocks at Buxton.

Devonshire.—Mr. Babington has observed it at Sheep's tor; Mr. Ralfs on Dartmoor, not unfrequently; Miss Hill at Ilfracombe; the Rev. W. S. Hore on the summit of Cock's tor; Mr. Kingston at Becky falls; and Jones, in the 'Flora Devoniensis,' records Lidforce waterfall as a locality.

Durham. — Mr. Watson informs me that Mr. R. B. Bowman found it at Cawsey dene; and Mr. Winch gives Cawsey wood, Waskerley dene, Cowclose, and Arngills, as localities.

Glamorganshire. — Mr. Lees found it at the waterfalls of Scwd-y-Gladis and Cilhepste; Mr. Dillwyn at Pont Nedd Vechn.

Herefordshire.—I have seen it in Shobden-hill woods, and at Aymestree quarry, at the latter place very luxuriantly and abundantly.

Lancashire. — Mr. S. Gibson informs me that it grows at Dulesgate, near Todmorden; Mr. Wilson at Lancaster, beyond the asylum, and at Dean-church clough near Bolton; Mr. Pinder at Fox clough near Colne, Padiham brook near Whalley, and on the Old-man mountain; Mr. Sidebotham at Mere-clough and Cotteril-clough; Miss Beever near Coniston; and Dr. Wood at Philip's wood near Prestwick, and Boghart-hole clough.

Merionethshire.—I observed this fern in several places near Barmouth, and at the waterfalls of Rhaidr-y-Mawddach, Pistil-y-Cayne, Dol-y-mellyn-lyn, &c.

Montgomeryshire.—I found it on the natural walls of several of the little fissures through which mountain streamlets flow, on the ascent of Plinlymmon.

Northumberland.—Mr. Winch has recorded as habitats the Cheviot hills, rocks west of Shewing-shields, moors near Wallington, &c.

Radnorshire. — Mr. Westcombe found it at the waterfall of Craig-pwll-du.

Shropshire.—Mr. Westcombe also observed it on the Shropshire or Titterstone Clee hill; and it has been found near the town of Ludlow by Mr. Westcott.

Staffordshire.—Mr. Pinder gives me Ridge hill and Madeley manor as stations where he has observed it.

Sussex.—Mr. Jenner discovered this fern in the great bog near Forest row, and has very obligingly supplied me with specimens from this locality.

Westmoreland.—Miss Beever and Mr. Pinder speak of this fern as of common occurrence in Westmoreland, at Ambleside, Grassmere &c.; Mr. Hindson gives me Hutton roof and Casterton fell as habitats; and Mr. S. Thompson mentions Dufton and Shap fells.

Yorkshire.—In this county the Beech Fern occurs in a great number of stations, and in most instances in abundance. Mr. Hardy gives me Sheffield as a habitat; Mr. Tatham, Settle; Mr. S. Gibson, Hebden bridge; Mr. Watson, Halifax; Mr. Spruce, Scawton howle, near Helmesley, Buttercrambe moor, Langwith lane, Teesdale &c.; Mr. Wilson, Ingleborough; Mr. Pinder and Mr. Ibbotson, Bolton-abbey woods: and besides these I find recorded in the 'Botanist's Guide' and Baines's 'Flora of Yorkshire,' Castle Howard, Hornby, Oldfield by Ripon, Dallow gill by Copgrove, wood in Soyland below Kebroyd mill, Wensley dale, Penhill, Bellerby moor, Shibden dale, Ogden clough, vale of Todmorden, &c.

Isle of Man.—Professor E. Forbes has found it in this island.

In Scotland this fern seems to be much more generally distributed than in England, although from dearth of information the list of localities is less copious than the English list.

Aberdeenshire.—Mr. Watson informs me he has found it on mountains about Braemar and Castleton.

Argyleshire.—I observed it at Inverary, Oban, Isle of Mull, Ballahulish and in the Pass of Glencroe; Mr. Babington obtained it at Crinnan.

Dumbartonshire.—I saw it at Luss, Tarbet, Arroquhar, and several other places on the banks of Loch Lomond and Loch Long; Mr. Gourlie has found it on Ben Voirlich.

Dumfriesshire.—Mr. Babington found it at Jardine hall, and Mr. Cruickshank at Drumlanrig and on the Rae hills.

EDINBURGHSHIRE.—Dr. Greville has collected it on the Pentland hills.

FIFESHIRE.—Found near Dunfermline by Professor Balfour.

FORFARSHIRE.—Mr. Watson records it as growing on Clova.

INVERNESSHIRE.—Mr. W. Thompson has observed it at Aberarder, ten miles south of Inverness; it was small near the roadside, but of great size and beauty at the waterfall of Nairn, in front of the shooting-lodge: and Mr. Watson found it on Ben Aulder, at Dalwhinnie, and on Ben Nevis.

KIRKCUDBRIGHTSHIRE.—Mr. Cruickshank informs me he finds it in the Dalskairth woods.

LANARKSHIRE.—I saw it in the utmost profusion in the woods at the falls of the Clyde, also at the waterfalls themselves, Boniton, Corra Lyn and Stone Byers; and Mr. Gourlie gives me Crutherland as a locality.

MORAY.—Rev. G. Gordon.

PERTHSHIRE.—I observed it near Tyndrum, Killin and Callender, and about Lochs Dochart, Tay, Vennachar, Katrine and Achray; Mr. Gourlie has found it on Ben Lawers; and Mr. Watson on this mountain, at Dalnacardoch, and Lochernehead.

RENFREWSHIRE.—Mr. Gourlie has observed it at Gourock.

ROSSHIRE.—Mr. Watson found it near Kessock.

SUTHERLAND.—Found by Mr. Watson near the Ferry-house, at the east end of Loch Errboll.

SHETLAND ISLES.—Mr. Edmonston informs me it occurs sparingly on the North Marm, in Shetland.

In Ireland *Polypodium Phegopteris* is a rare fern: I never had the good fortune to find it, although I searched in almost every county: when present it occurs in small quantities, and rarely attains that beautiful luxuriance which renders it so attractive an object in England, Wales and Scotland.

ANTRIM.—Mr. W. Thompson informs me it was found by the late Mr. Templeton, on the banks of the Glenarve river, half a mile from Cushendall; and Mr. Moore found it at several mountain rills and waterfalls in this county.

DONEGAL.—Mr. Mackay says it occurs at the waterfall above Lough Eske, in this county.

DOWN.—Mr. Thompson informs me it was found by the late

Mr. Templeton on Slieve Bignian (2449 feet), and on rough ground two miles south of Slieve Croob; Mr. Thompson gathered it on the Black mountain above Tollymore park, in 1836.

Kerry. — Dr. Taylor has found it in the marshes near Mr. Herbert's house at Mucruss; and Mr. Moore between Killarney and Kenmare.

Londonderry.—Found in Ness glen by the late Mr. Templeton.

Louth. — Mr. Thompson gathered specimens on Carlingford mountain in 1836; it appears, from the MS. notes of the late Mr. Templeton, that it was first found in this locality by Dr. Robert Brown.

Wicklow. — Mr. Mackay has found it at Powerscourt waterfall; several botanists have recorded this habitat, which seems the most abundant one in the island.

The geographical range of this species is not well ascertained: it is included in every European list, and might be expected to grow in the corresponding latitudes of Asia, but I am not aware of its having been recorded as an inhabitant of that continent, or of Africa. The North-American *Polypodium connectile*, for specimens of which I am indebted to Mr. Boott and Mr. Lea, is so similar that I can scarcely assent to the opinion of that plant being distinct as a species.

The figures of this fern do not appear to me so satisfactory as its marked character seems to require, for it is not only a most graceful, but a peculiarly well-marked fern; its long naked stem, triangular form, marginal clusters of capsules, and the unusual position and complete separation of its lowest pair of pinnæ, are very striking diagnostics. In 'English Botany' it seems to have been figured twice, first under the name of *Aspidium Thelypteris*,* and subsequently as *Polypodium Phegopteris*.† In Bolton's 'Filices' ‡ the figure is far from characteristic, and Mr. Francis § seems to have figured an extra-European fern in its stead; as the European species never has the pinnæ so completely divided as he has represented them.

The English name of Beech Fern, derived from the specific

* Eng. Bot. 1018. † Id. 2224. ‡ Bolt. Fil. tab. 20.

§ Analysis, pl. i. fig. 3.

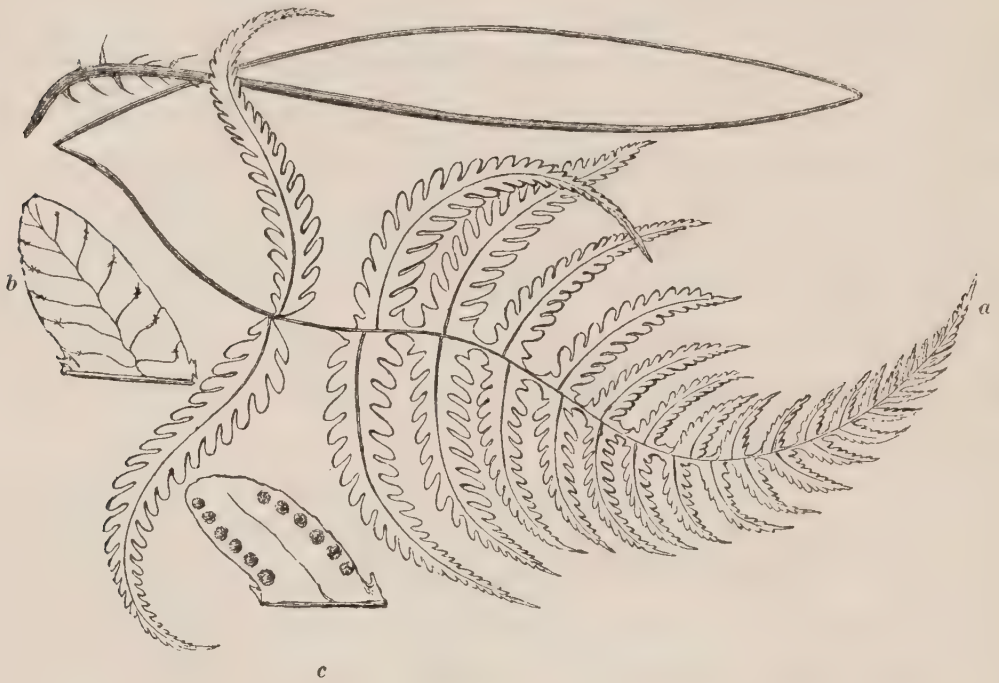
name of *Phegopteris*, seems very inappropriate, as was observed by Sir J. E. Smith, and I feel quite at a loss to discover the reason for either having been employed: both of them convey an obviously incorrect impression, as neither the character nor localities of the fern have any connection with the beech tree. Nearly all authors are agreed on the scientific name of this species, and have referred it to the genus *Polypodium*, distinguished by circular clusters of capsules, and by the total absence of an involucre; but this character can only be applied in doubt to this and the following species, for Roth, than whom we have had no more careful or accurate observer, unhesitatingly states that both species possess an involucre, and he therefore refers them both to his genus *Polystichum*.*

This involucre I have hitherto been unable to detect; still although the presence or absence of an involucre may remain a question for future investigation, it must be admitted by all botanists capable of forming an opinion, that the species before us would associate much more naturally with *Oreopteris* and *Thelypteris* than with the common polypody, its present congener.

The roots of the beech fern are black and fibrous, its rhizoma wiry, tough and creeping. The fronds are thrown up in May, rising on erect, succulent, and very brittle stems, clothed with a few pale scattered scales. I have taken some pains to represent these young fronds at page 115, in every stage of development. They unfold with wonderful rapidity, attain perfection in July, and are destroyed by the early frosts on the approach of winter. The position of the frond is at first nearly horizontal, afterwards pendulous; its size varies from that of the frond represented in

* *Polystichum Phegopteris.* Fructificationum puncta subrotunda distincta, nunquam confluentia, ad marginem laciniarum infra medium sparsa, ex albido flavescentia, tecta Involucro tenui, membranaceo, albido, peltato, capsulis maturis parum elevato, et ad punctum centrale fixum contracto demum ob capsulas supereminentes plane obliterato. * * * In plerisque filicibus capsulæ rupto Involucro effunduntur pedunculis suis divergentibus et curvatis. In hoc vero Polysticho capsulæ minus effunduntur sed soluto involucro pedunculis rectis in altum tolluntur quo facto involucrum ad punctum centrale fixum contractum, demum plane obliteratur, relicta plerumque in centro acervuli capsularum foveola.—Roth, Flor. Germ. iii. 73.

the figure (fig. *a*) to nine inches in length, exclusive of the naked part of the stem, which is usually twice as long as the frond.



The figure of the frond is triangular and acute at the apex; it is pinnate, the pinnæ being pinnatifid, linear, and very acute at the apex; the lower pair of pinnæ are turned back from the apex of the frond; they are united to the stem by the midrib only: the remaining pinnæ point forwards, and are united to the stem by their entire diameter, and also to each other: the fronds, including their stem, are pale green and hirsute; they are fertile only.

The lateral veins of the pinnules are few in number, alternate, almost invariably undivided, and extend to the margin, each bearing a circular cluster of capsules near its extremity; these clusters consequently form a submarginal series; they are of a brown colour. In one of the detached pinnules in the cut (fig. *b*) will be seen the position of the veins, and the attachment of the capsules; in the other (fig. *c*) the clusters of capsules are represented in their natural situation.

OAK FERN, (*one third the natural size*).

POLYPODIUM DRYOPTERIS, Linneus.

THE Oak Fern is one of our most elegant and delicate species: like the last, it is almost entirely confined to wild and mountainous districts, wet woods, and the vicinity of waterfalls. On the most bleak and exposed mountains it ascends to a considerable height, sheltering beneath ledges of rock, and under masses of stone. It principally occurs in our northern English, our Welch and our Scotch counties, but in Ireland is a fern of excessive rarity.

The range of this fern, as regards England and Wales, somewhat corresponds with that of *Polypodium Phegopteris*, but appears to be more restricted; for so great a doubt attends the recorded locality in Devonshire, that it must be omitted until confirmed by fresh observation. If the island were divided by an oblique but irregular line, composed of the rivers Trent and Severn, and the Bristol channel, we shall find *P. Dryopteris* present in most of the counties to the north-west of this line, and nearly absent from those to the south-east; this is the more

remarkable, since many situations, especially in Cornwall, Devon, Somerset, Dorset and Wilts, seem peculiarly adapted to the growth of such a fern. I have given a list of the counties in which I have ascertained its presence, together with a few localities.

ANGLESEA. — I have seen specimens from this county, but do not know the locality.

BRECKNOCKSHIRE.—Mr. Ralfs has found it in woods near Brecon, and at Trecastle; Mr. Lees at Pont Henryd and Capel Colboen; and Mr. Westcombe near Ystrad Felltree.

CAERNARVONSHIRE. — I have observed it near Bangor; at Rhaidr-y-Wenol; in the pass of Llanberis; at Cwm Idwell &c.

CHESHIRE. — Mr. Wilson has observed it of very large size about two miles south of Warrington.

CARDIGANSHIRE. — I have noticed it at Ponterwyd, and throughout the Devil's bridge district.

CUMBERLAND.—Mr. Watson informs me he has observed it at Lodore, near Keswick; Mr. Heysham near Honister crags, and in the village of Grange in Borrowdale; Mr. Pinder at Calder bridge, Ponsonby screes, Wasdale &c.; and Mr. Winch gives Ashness gill, Scale force, and Gillsland, as localities.

DENBIGHSHIRE. — I observed it scattered over a rock on the left hand by the road-side just leaving Llangollen for the Capel Curig road; the plants were small and discoloured, and the leaves convolute.

DERBYSHIRE. — In the 'Botanist's Guide' the rocks about Pleasley forges, and Chinley hill near Chapel-le-Frith, are recorded as localities.

DURHAM.—Mr. Watson gives me this county as a habitat, on the authority of Mr. R. B. Bowman; and Mr. Winch found it in Scots' wood and Walbottle denes.

FLINTSHIRE.—I have a memorandum that it has been found in this county near the town of St. Asaph.

GLAMORGANSHIRE. — Mr. Dillwyn has found it about Pont Nedd Vechn, and Mr. Lees at the waterfalls of Scwd-y-Gladis and Cilhepste; and I once received specimens from the vicinity of Merthyr Tydfil.

GLOUCESTERSHIRE. — Withering has recorded its occurrence

in woods, north-east of the road up Frocester hill; and Mr. Lees informs me it grows in the forest of Dean, south-east of the rocks of New weir, on the Wye, by a path through the woods towards Staunton.

HEREFORDSHIRE.—Mr. Lees has observed it in great profusion by the side of a shady path in a wood or copse on the southern side of the Teme, leading from a wooden bridge over the river in Mr. Knight's grounds, and not far from Downton castle; I have found it near Aymestree quarry, and in immense profusion in Shobden-hill woods: in the latter locality it covers acres of ground, is of small size, and all the divisions of the frond are convex or convolute.

LANCASHIRE.—Mr. Gibson gives me Broad-bank, near Colne, as a locality, and has obligingly given me specimens, which are of the convolute form; Mr. Wilson, Dean-church clough; Mr. Pinder, Marsden, near Colne, and Padiham brook; Mr. Sidebotham, Mere-clough and Cotteril-clough; Mr. Simpson, Lancaster; Miss Beever, Coniston; and Dr. Wood, Ashworth wood.

MERIONETHSHIRE.—I observed it near the base of Plinlymmon.

MONMOUTHSHIRE. — I observed it in the woods near Tintern Abbey.

MONTGOMERYSHIRE. — Found on Craig Breidden, by the late Mr. J. E. Bowman.—*Francis's Analysis.*

NORTHUMBERLAND. — Mr. Winch found it in Scott's wood dene, on the Cheviots, and on rocks west of Shewing-shields; Mr. Thompson observed it at the 'Dene' at Twizell, the seat of P. J. Selby, Esq.

OXFORDSHIRE. — Cornbury quarry, on the authority of Sibthorp.—*Botanists' Guide.*

RADNORSHIRE. — Mr. Westcombe observed it at the waterfall of Craig-Pwll-du; and I have several times seen it at Water-break-it's-neck.

SHROPSHIRE.—Mr. Cameron, Mr. Westcombe, Mr. Westcott, and several other botanists, have observed it on the Hoar Edge, Titterstone Clee hill; and Mr. Westcott has found it in Whitcliffe coppice, near Ludlow.

SOMERSETSHIRE. — Mr. Flower informs me he has found it in rocky places on the Mendip hills, also near Bristol and near Bath.

Staffordshire. — Mr. Pinder informs me he has found it in Trentham park; Mr. Beynon, in the grounds of the Rev. Thos. Gisborne, of Yoxall lodge; and Mr. Carter, that it occurs abundantly in a lane leading from Oakamoor to Cotton hall, and also on stone walls by the road-side, near Cotton hall.

Westmoreland. — Mr. Pinder considers it abundant in this county; Mr. S. Thompson finds it at Dufton; Miss Beever at Ambleside; Mr. Hindson at Hutton roof and Casterton fell.

Worcestershire. — Mr. Lees finds it plentifully on the Malvern hills, in a stony ravine between the north and end hills, north of Great Malvern; Mr. Westcombe has found it on the north hill, and in Shrawley wood. I am indebted to the liberality of the Botanical Society of London for specimens from the first of these localities.

Yorkshire. — Mr. Hardy finds it near Sheffield, and on Anster rocks; Mr. Gibson near Hebden bridge; Mr. Pinder in Bolton-abbey woods, from which locality he has presented me with fine specimens; Mr. Watson in woods near Halifax; Mr. Backhouse in Castle Howard park, Whitstoncliff, near Thirsk; and various parts of the North and West Ridings; Mr. Wilson on Ingleborough; Mr. Ibbotson in Rivaulx woods, Luilesworth vale, and Cave-hole woods; a number of other localities are recorded — as Brimham rocks, Teesdale, Pickering, Whitby, Richmond, Helmsley, Birks' wood, North Dean wood, Putton park and other woods near Halifax, Dallowgill, Hackfall, Sawley moor, &c.

In Scotland *Polypodium Dryopteris* is very generally distributed; I have ascertained the following stations.

Aberdeenshire.—Mr. Watson informs me he obtained it near Castletown, in Braemar, and on the adjacent mountains.

Argyleshire.—When wandering in the ravines between Lochs Awe and Etive, I saw this fern in greater profusion than ever before or since; I also observed it in many other parts of the same county; and Mr. Gourlie gives me Brodick and the Isle of Arran as localities, on the authority of Mr. Adamson.

Dumbartonshire.—I observed it in several places near Loch Lomond; and Mr. Gourlie has found it on Ben Voirlich.

Dumfriesshire.—Mr. Cruickshank informs me he has found it at Drumlanrigge, and on the Rae hills.

Edinburghshire. — Mr. Watson has observed it in the Auchindenny woods.

Forfarshire. — Mr. Gardiner has found it abundantly on the Sidlaw hills ; and Mr. Watson on the Clova mountains.

Invernesshire.—Mr. W. Thompson says, "This fern grows about Aberarder, where I was much interested in observing that at Glen Marson it grew plentifully, when protected by the sheltering canopy of the fine old junipers (which are abundant there), and nowhere else than beneath their shade : it was on the 13th September, 1842, and all the *Dryopteris* was of an autumnal brown hue. On the 17th of the month, in a more open locality, about the waterfall of the Nairn, the plant was in the highest perfection, displaying its lovely and tender green fronds." Mr. Watson found it on Ben Aulder and at Dalwhinnie.

Kincardineshire.—Mr. Watson informs me, on the authority of specimens distributed by the Botanical Society of Edinburgh, that it has been found at Inglis-Maldie.

Kirkcudbrightshire.—Mr. Cruickshank informs me he has found this fern in Dalskairth and Glen woods, and other places in the county.

Lanarkshire. — Mr. Gourlie has observed it on the banks of the Kelvin ; and I have seen it in several places near the falls of the Clyde.

Perthshire. — Mr. Gourlie has found it on Ben Lawers, and Mr. Watson on the Breadalbane mountains, on moors about Dalnacardoch, and about Killin ; I observed it in several places near the last-named town.

Renfrewshire. — Mr. Gourlie informs me he has found it at Gourock and Port Glasgow.

Rosshire. — Mr. Watson informs me that it was observed in this county by the Rev. G. Gordon.

Sutherlandshire. — Mr. Watson observed it near the Ferry-house, on the east side of Loch Erboll.

This fern has not been observed by Mr. Clouston in Orkney, by Mr. Edmonston in Shetland, or by Professor Forbes in the Isle of Man.

In Ireland this is the rarest of all our ferns.

Antrim.—Mr. Moore found a single plant on Knochlayd.

Down.—Mr. Mackay gives the Mourne mountains as a locality.—*Flora Hibernica.*

Galway.—Mr. Mackay gives Mam Turk as a locality.—*Flora Hibernica.*

Kerry.—Mr. Woodward informs me there is a single frond in Dr. Taylor's herbarium, labelled Mucruss.

The geographical range of this species is very extensive: it occurs in every country of Europe from the North Cape to Gibraltar, and extends eastward into Turkey, Russia, and Northern Asia, and southward into Africa: it is also found throughout the United States of North America. It ascends to the exposed summits of mountains, especially if dry, almost reaching the extreme limits of vegetation, and yet luxuriates in the warmest woods if amply provided with shelter and moisture. I know of no fern enjoying so great a range of latitude, longitude, and elevation.

The figures of this fern, like those of the last, are less characteristic than its remarkable form would lead us to expect; those in Bolton's 'Filices'* and 'English Botany'† are better than most, but that in Mr. Francis's 'Analysis'‡ is incorrect as regards outline and position, the triple character of the frond is not well expressed: that in 'Flora Danica' is also bad, and is supposed by some subsequent authors to have been intended for *Lastræa dilatata*.

The name of Oak Fern, derived from *Dryopteris*, appears as inapplicable as that of Beech Fern to the species last described, and is adopted in deference to the opinions of others. The scientific name of *Polypodium Dryopteris* has been employed by all authors of repute, Roth alone excepted, who describes it as having an involucre nearly similar to that which he assigns to *P. Phegopteris*, and he consequently refers it to his genus *Polystichum*.§

* Bolt. Fil. tab. 28, *not* tab. 1. † Eng. Bot. 1525.

‡ Analysis, Pl. 1, figs. 3 and 4.

§ *Polystichum Dryopteris.* Fructificationum puncta primum distincta et Involucro tecta peltato, tenui, flavescenti, undique tunc libero, at punctum centrale fixum contracto, corrugato et demum obliterato, &c.—Roth, Flor. Germ. ii. 81.

The roots are black and fibrous; the rhizoma black, wiry and creeping, often, when long established, forming a dense matted mass. The young fronds make their appearance in March and April, each at first resembling three little balls on wires, presenting a very curious and excellent diagnostic; these three balls gradually unfold, and display the triple character of the frond. The fronds soon arrive at maturity; I have found them loaded with ripe seed as early as June: before winter they have usually entirely disappeared. The common stem is very slender, dark purple and shining, and is frequently twice as long as the frond; it has a few scattered scales towards the base. The frond is triple, or composed of three distinct triangular portions, each of which has a short but distinct stem, and these three unite with the common stem at an obtuse angle, as represented in the figure at page 123. Each division of the frond is pinnate, and the pinnæ are opposite, pinnate at the base, and pinnatifid towards the centre, terminating in a somewhat acute apex; the basal pinnules are sessile, and of nearly equal size, so that the four occurring at each union of the pinnæ with the stem, form a cross. The mid-vein of each pinnule or ultimate division is sinuous, and the lateral veins are alternate and mostly simple, each terminates at the margin, and generally bears a circular cluster of dark brown capsules near its extremity: in some specimens these clusters are so densely crowded as to form a marginal line, in others they are scattered and very distant. The fronds are of a most vivid and beautiful green, in this respect surpassing every other species with which I am acquainted: when of full growth and mature, they are always fertile. In many specimens the frond is much more divided than the one which I have selected for my figure and description; and in such instances the veins and clusters of capsules partake of the subdivision. It should also be observed that the two lateral divisions of the fronds may, without impropriety, be termed the first pair of pinnæ, in which case their divisions would be pinnules, and not pinnæ as I have here denominated them, from a desire to avoid a confusion of terms.

In the cut at page 123, figure *a* represents a portion of the creeping rhizoma with three unexpanded fronds; figure *b* an

expanded frond ; figure *c* a pinnule, showing the veins and the points of attachment of the capsules ; and figure *d* another pinnule, with the clusters of capsules *in situ*.

The vignette below represents the Devil's bridge in Cardiganshire : it is well known to botanists as a rich fern locality, and the present species occurs in its immediate vicinity.

SMITH'S FERN, (*young fronds of the natural size*).

POLYPODIUM CALCAREUM, Smith, Hooker, Babington.

THIS fern is confined to limestone districts, where it grows in exposed situations, among loose stones. In Great Britain it must be considered a very local species, and I therefore offer a list of all the habitats which have come to my knowledge; these

are confined to nine English and three Welch counties, and concerning one of the latter—Caernarvonshire—I entertain many doubts. I am not aware of its occurrence in Scotland or Ireland.

Caernarvonshire.—Found at Cwm Idwell, by Mr. Griffiths. —*Botanist's Guide.* I know this district, and have never found it there.

Cumberland. — Mr. Heysham informs me he has found it on shady rocks in Newbiggin wood, Gelt quarries, Baron heath, &c.

Denbighshire.—I am indebted to Mr. Kippist for specimens gathered near Llanferris by Miss E. Potts.

Derbyshire. — Mr. Pinder informs me he has found it plentifully at Matlock; and Dr. Wood that it occurs in profusion on the limestone rocks at Buxton.

Glamorganshire. — Mr. Babington gives me Merthyr Tydfil as a locality, on the authority of the Rev. Mr. Bree.

Gloucestershire. — Miss Arch has shown me a fine frond from Besbury common, between Minchinhampton and Brinscombe, where it grows abundantly; Mr. Lees has found it on the rocks close to the path by the side of the Wye, between New Weir and Symond's Yat, and among the rocks at Lydbrook, in the Forest of Dean, also in a ravine of the Cotswolds, and abundantly on the glacis of the rock at Clevecloud; Mr. Buckman observed it near Postlip hall, also on the Cotswolds.

Lancashire.— Mr. Watson gives me Lancaster and Shedenclough as localities; and Mr. Gibson, Broadbank.

Oxfordshire.—Mr. Westcombe informs me he has seen this fern in Oxfordshire.

Somersetshire. — Mr. Flower has found it near Bath, in Leigh woods near Bristol, Cheddar cliffs, Mendip hills, Friary wood, and Hinton Abbey; Mr. Tanner has very kindly sent me roots from the Cheddar station.

Westmoreland. — Mr. Watson informs me that it has been found by Mr. Haslam at Scout, near Kendal; Mr. J. Ball also finds it near Kendal; Miss Beever abundantly on Arnside knot; Mr. Pinder on Hutton roof and Farlton knot; and Mr. Hindson at Caskill kirk.

Wiltshire.—Mr. Babington and Mr. Flower have found it at Box quarries.

Yorkshire.—Mr. Hardy informs me that this plant is plentiful on Anster rocks; Mr. Tatham, Mr. Backhouse and Mr. Gibson have found it abundantly on the hills near Settle; Mr. Wilson observed it, growing with *Dryopteris*, on Ingleborough; and Mr. Watson gives me Arncliffe and Gordale as habitats, on the authority of Mr. R. B. Bowman.

It has been found, according to Sadler, in Hungary, Germany and France, but in no other country of Europe, neither am I aware of its existence in Asia or Africa; but I possess a frond from the State of New York, and Sadler also gives it without a doubt as a native of North America.

We are indebted to Bolton for first noticing and describing this fern, which he treated as a variety of *P. Dryopteris.* "I have observed," says this author, "a variety of this plant growing in White Scars, near Ingleton, and in the Peak of Derbyshire, wherein the rib is taller, more firm, hard and robust, white and opaque; the leaves larger, the number of parts greater, and the largest of the lobes are again partly lobed, or divided down half-way to the middle rib: this variety I have figured, tab. 1, fig. 1."* The plant, however, was named and characterized as a species by Sir J. E. Smith; his description is in these words: "Frond three-branched; branches doubly pinnate, erect, rather rigid; segments obtuse, somewhat crenate. Masses of capsules crowded, finally confluent. * * * Root creeping, but stouter and less extended than in the preceding species (*P. Dryopteris*). Frond more firm and rigid; its stalk more scaly about the lower part. All the three branches upright, smaller than the last, rigid, and not loosely spreading. Masses of capsules more crowded, finally in some degree confluent, and of a browner hue."† Sadler admits this species with doubt, and other continental authors, with one or two exceptions, have left it unnoticed. Our British authors, Hooker and Babington, admit it as a species; the latter gives the following description, which, it may be observed, comprises diagnostics of more value than any pointed out by Bolton or Smith. "Fronds subternate, *glandular-mealy*, lower branches pinnate; pinnæ pinnatifid, obtuse, the uppermost nearly entire;

* Bolt. Fil. p. 53. † Eng. Flor. iv. 270.

sori marginal. Very different in habit from the preceding (*P. Dryopteris*), and always covered with very minute stalked glands, giving a mealy character to the surface. Frond not so decidedly trifid, the lower branches being much smaller in proportion to the middle one; all the three erect, rigid."* Mr. Wilson, whose authority in British ferns is certainly inferior to no one's, also considers the present species distinct from *P. Dryopteris*. "I consider these plants," says Mr. Wilson, "to be quite distinct, the former [*P. calcareum*] having truly the erect habit which Smith describes; I believe also that the pubescence is constantly present in *P. calcareum*. The two species are generally found in different habitats, but in a wood on the side of Ingleborough, as you go to Weathercote, they are found in company. I have cultivated them side by side for many years, with their respective characters unchanged."† Mrs. Riley, of Papplewick, near Nottingham, has written a few lines on the same subject, which I shall take the liberty of quoting. "The pubescence, which is one distinguishing character of *P. calcareum*, is a beautiful microscopic object, each slender stem supporting a globular head, but this pubescence soon dries, so that only on freshly gathered specimens can it be fully perceived or accurately examined. Though we found *P. Dryopteris* frequently in Wales, we never met with *P. calcareum* there; and though, like Mr. Wilson, we have cultivated them side by side for years, we can also testify that their respective characters remain unchanged."‡ In letters received from the Rev. Mr. Bree, and Mr. Cameron of Birmingham, opinions very similar to those now quoted are expressed, both these excellent botanists regarding *P. calcareum* as a truly distinct species.

The figure and description of *Dryopteris Tragi* in Gerarde,§ as quoted by Smith,‖ is apparently intended for this species: there is a tolerably characteristic figure in Bolton's 'Filices,'¶ and also in 'English Botany,'** the last under the name of *P. calcareum*, but that in Francis' 'Analysis'†† is evidently drawn

* Manual, 384. † Phytologist, 74. ‡ Id. 94. § Ger. Em. 1135.
‖ Eng. Flor. iv. 270.
¶ Bolt. Fil. tab. 1, fig. 1. ** Eng. Bot. 1525. †† Analysis, pl. 1, fig. 5.

from *P. Dryopteris*, the form of the unexpanded fronds being characteristic of that species only.

The roots are fibrous, and in all respects resemble those of *P. Dryopteris :* the rhizoma, described as the root by Smith, in the passage previously cited, is dark brown, creeping, and somewhat stouter than in *P. Dryopteris*. The fronds make their appearance in May, and their habit and mode of unfolding differs from that of *P. Dryopteris ;* the three portions of the frond never assume the appearance of three little balls, which I have noticed as an excellent diagnostic of *P. Dryopteris*, but all the pinnules appear somewhat globular, the first pair of pinnæ differing from the second in little else than magnitude. I have taken great pains to give a faithful representation of some young fronds: I divided the stem of each on account of its inconvenient length, and laying them on the block before me, made an accurate copy both as regards size and figure (p. 131). The stems are much stouter and more succulent than those of *P. Dryopteris*, and I think also more scaly; they are of the same dull green as the frond, whereas those of *P. Dryopteris* are frequently purple or blackish, and have a more wiry appearance. The frond attains its full development in July, and matures its seed in August.

The form of the expanded frond is nearly triangular, the base being shorter than the sides, and altogether not unlike that of the common Brakes ; the pinnæ are opposite, the first pair always have a short naked stem ; the second pair frequently have this, but not invariably ; and the naked stem of the first pair of pinnæ is always much shorter and more slender than the main stem between the first and second pair, whereas in *P. Dryopteris* these three stems are of nearly equal length and thickness ; the pinnæ are pinnate, the pinnules deeply pinnatifid ; all parts of the frond are covered with the mealy pubescence described by

Mr. Babington: it consists of a number of minute, stalked glands. The bend, so observable in *P. Dryopteris* at the point of union of its three branches, is much less marked in *P. calcareum*. The lateral veins of the lobes of the pinnules are undivided, and the capsules are borne in circular clusters near the termination of each, as in both the preceding species. These clusters become confluent in the autumn, and form a continuous marginal series.

RAY'S WOODSIA (*natural size*).

WOODSIA ILVENSIS, Smith,* Hooker, Babington.

THIS is one of the rarest of our ferns: it roots in the fissures of rocks, in the most bleak and exposed mountainous regions: it has hitherto occurred to botanists in two counties in England, one in Wales, and one in Scotland.

* The true *Ilvensis* of Linneus is figured on the opposite page, from a specimen in Mr. Woodward's herbarium, said to have been found in Wales; but as some little difficulty arose in tracing its history I prefer figuring in illustration of Smith's *Woodsia Ilvensis*, specimens whose claim to be considered British admits of no question.

Caernarvonshire.—I think there can be no doubt that this fern is the *Filix alpina* found by Dr. Richardson "on a moist rock called Clogwyn-y-Garnedd, one of the highest points of Snowdon," as recorded in Ray's 'Synopsis.'* Bolton appears to have figured the same fern, from the same locality, under the name of *Acrostichum Ilvense*. Mr. Wilson found it near Llyn-y-cwn, on Glyder Vawr, in 1824; and it has since been seen by Mr. Borrer, Mr. Roberts of Bangor, and I believe several other botanists, directed to the spot by Mr. Wilson. I am indebted to the kindness of Mr. Wilson and Mr. Pamplin for specimens from the Llyn-y-cwn locality, but I believe there are no specimens now in existence from Clogwyn-y-Garnedd; the two fronds represented at *a*, on the preceding page, are from this station.

Durham.—Mr. Winch, in his 'Flora of Northumberland and Durham,' gives these localities, "Near the summit of some bold basaltic rocks, called Falcon Clints, about ten miles west of Middleton, in Teesdale, *Mr. S. Halestone*. At the foot of basaltic rocks, on the Durham side of the river Tees, about two hundred yards below Cauldron Snout, *Mr. J. Backhouse*." Mr. Winch observes that these localities must be near together.—Mr. Simpson observed the plant there in 1838, and has kindly presented me with a frond. "Recrossing the bridge," says Mr. Simpson, "we pursued the course of the stream, which, almost immediately below the Snout, takes a sudden turn, and thus we found our track hemmed in by the over-laden Tees on our right hand, and the lofty basaltic rocks called Falcon Clints on our left. My eye was now anxiously directed to the face of these rocks, to discover, if possible, the chief object in taking our present course—*Woodsia Ilvensis*. Rain now began to fall heavily, and the wind, which had been all day very tempestuous, bore it against us so as to render observation, either of locality or objects, very imperfect. However, after tracing as near as I can judge about 400 yards, I espied some small specks of green through the broken fragments of a stream which poured over the Clints, and under which I soon stood, pulling hastily the patches I had seen, and these, to my delight, proved to be two

* Syn. 118.

small plants of the *Woodsia*, mixed with a few fronds of *Asplenium viride* and *Cystopteris fragilis*."* Mr. King found several specimens in 1841. "Here," says Mr. King, "I cast around many an anxious look for *Woodsia Ilvensis;* at length, after much searching, and a good wetting from the drip of the water from the huge basaltic rocks, to my great joy I espied two small plants, which were instantly secured; a little farther on we saw three more under a bush of *Prunus Padus*, but, not liking to destroy the plant, we left the roots of these in the crevice of the rock where they were growing."† Mr. J. Backhouse, jun., Mr. Babington, Mr. Borrer, and other botanists, have repeatedly verified this Falcon Clints station; and I have to acknowledge my thanks to these botanists for the opportunity of examining and comparing specimens, and to Mr. Kippist for a specimen gathered in the same locality by Mr. Woods: the five fronds represented at *b* are from this station.

Forfarshire.—I am indebted to Dr. Greville for a specimen from the Clova mountains; and the very fine specimen represented at fig. *c* was gathered in August, 1836, in Glen Phee, by Mr. Wilson, who most obligingly favored me with the drawing, of which that figure is a *fac simile* copy.

Westmoreland.—The following interesting note appeared in the 16th number of 'The Phytologist.' "On the 17th of 8th month [August] 1798, my father gathered a single frond of a fern from Crosby-Ravensworth Church, Westmoreland. Being unable to name it he showed it to several botanists in London, who could not decide what it was; Lewis Dillwyn at length sent it to Sir J. E. Smith, who returned the specimen labelled as follows:—

"Polypodium arvonicum,
With. et Fl. Brit. J. E. Smith.
P. ilvense, *With. &*
Acrost. ilvense, *Huds.*
(not Linn.)
Acr. alpinum, *Bolt.*"

The original specimen is now in my possession, with Sir J. E. Smith's autograph; the frond is $3\frac{1}{4}$ inches in length from the bottom of the rachis to the apex, and about two inches from

* Phytologist, 75. † Id. 114.

the lowest pinnæ to the apex. The church has been pulled down and rebuilt within the last few years. — *Silvanus Thompson.*"* I have not seen this specimen, and therefore entertain a doubt whether it belong to this species or the next.

The figures of this fern in Bolton's 'Filices,'† 'English Botany,'‡ and Mr. Francis's 'Analysis,'§ give but a very imperfect idea of the plant; the latter is particularly unlike. Of the continental figures I entertain so much doubt as to their representing our British plant, that I forbear quoting them. The doubt, of course, is equally applicable to nomenclature, and I name the species as *Woodsia Ilvensis* of our British authors, without attempting to prove it the *Acrostichum Ilvense* of Linneus. I have no doubt, as before stated, that it is the *Filix alpina, Pedicularis rubræ foliis subtus villosis* of Ray, although this description is referred by Sir J. E. Smith to the plant I have next described. I am extremely gratified to find that Mr. Wilson entertains a similar opinion. In a letter just received, Mr. Wilson says, "I cannot help thinking that the synonym in Ray's 'Synopsis,' usually applied to the other species, belongs to this fern, notwithstanding that in the locality pointed out by Ray, on Snowdon, I find only *W. hyperborea*, which I have never seen there '*foliis sex circiter digitis longis*,' and which less resembles *Pedicularis*." Ray's description appears to me to lay stress on all the points in which the present plant chiefly differs from the next. There can be scarcely a doubt that the plant now under consideration is the *Polypodium arvonicum* of Withering, whose description—"Leafits spear-shaped, wing-cleft, hairy underneath; stem hairy"‖—is peculiarly apt. I am indebted to the kindness of Dr. Robert Brown, for specimens gathered by himself in the north of Europe, of the true *Acrostichum Ilvense* of Linneus, and these, while agreeing exactly with the authentic Linnean specimen in the herbarium of the Linnean Society, differ so much from the British plant that I hesitate to pronounce them identical. Should the British plant prove distinct, I beg to propose it should bear the name of *Woodsia Raiana*. The doubt

* Phytologist, 331. † Bolt. Fil. tab. 9. ‡ Eng. Bot. Supp. 2616.
§ Analysis, pl. i. fig. 6 A. ‖ Arr. Brit. Pl. iii. 774.

as to this species being distinct from *W. alpina* (*W. hyperborea* of Smith) will again be noticed under my description of that species.

With regard to the genus to which these little plants are referrible, considerable difference of opinion appears to prevail. Linneus, Bolton, Liljeblad, and Hudson, place them in the genus *Acrostichum:* Withering, Sowerby, Willdenow, Sprengel, Schkuhr, Wahlenberg, and Presl, in the genus *Polypodium:* Lamarck and Decandolle in the genus *Ceterach:* Smith, Hooker, Sadler, and Babington, in the genus *Woodsia*, instituted by Dr. Robert Brown purposely to receive them. The description of this genus was published in the eleventh volume of the Linnean Transactions,* and its distinguishing character consists in the peculiar structure of the involucre, which is inserted under the cluster of capsules, the attachment of which it surrounds, while its margin, as in the linear involucre of *Pteris*, already described, is split into a number of jointed capillary segments, which intermingle with the capsules, partially concealing them.†

The roots are black, wiry, and sparingly branched: the rhizoma thick, tufted, and lasting many years: the stem is very distinctly jointed at a distance of three quarters of an inch from its junction with the rhizoma; the articulation is swollen, and very obvious to the naked eye when the frond is mature; at this point, as far as my observation has extended, separation generally takes place, the basal portion of each stem adhering to the rhizoma. This very interesting character, common to all plants of this genus, is well described by Wahlenberg,‡ whose observations I have quoted under my next species. The stem above this joint, and between the pinnæ, is clothed with lanceolate scales, and shining jointed hairs: the form of the frond is lanceolate and pinnate: the pinnæ are in pairs, and generally opposite, oblong, obtuse, deeply lobed, and in some specimens pinnatifid, in which case the lobes are crenate, as in figure *c*. The upper surface of the frond appears quite smooth to the naked eye, but under a lens of high power, a few long bristle-

* Trans. Linn. Soc. xi. 170. † See Appendix D.

‡ Flor. Lapp. 279.

like scales, are observable, all of them pointing outwards. The under surface appears pubescent, and with the aid of a lens this pubescence is found to consist, *first* of very long, pointed, narrow scales, which are more particularly abundant about the midrib; *secondly*, of jointed and shining hairs, which are scattered nearly over the whole surface; and *thirdly*, of the capillary segments of the involucres, which are also jointed and shining. The capsules are placed in circular clusters near the margins of the lobes or pinnules; they are frequently concealed by the pubescence already described; when arrived at maturity they become confluent, and occupy all the margins of the pinnules.

The vignette below is intended to represent Cwm Idwell: Llyn-y-Cwn or the Dog's lake, near which Mr. Wilson finds the little fern now described, is situate just beyond this rampart of rock.

† BOLTON'S WOODSIA (*natural size*).

WOODSIA ALPINA, Newman.

Woodsia hyperborea, Smith, Hooker.

Woodsia Ilvensis γ. Babington.

THIS is one of the rarest ferns in Britain ; it has only occurred in one Welch and two Scotch counties : it roots in the fissures of rocks in the wildest and most inaccessible mountain regions.

CAERNARVONSHIRE. — This fern was found by Mr. Wilson on Clogwyn-y-Garnedd, one of the precipices of Snowdon which faces the east, as observed by that botanist, on whose

authority Smith corrected the error of Ray and others, who described this precipice as facing the north-west: the locality, it will be observed, is that pointed out by Ray for the preceding species.

PERTHSHIRE.—According to Smith and other authorities, Mr. Dickson, Mr. G. Don, and the Rev. Dr. Stuart, found this plant on Ben Lawers. Mr. Wilson informs me he found it on Ben Lawers, Mael-dun-Crosk, Craig-Challiach, and other mountains, in 1827, and again on Ben Lawers in 1836; and Mr. Watson gives me Craig-Challiach, on the authority of Mr. Maughan.

On the continent of Europe it has been observed in Lapland, Sweden, Germany, Hungary, France and Spain. I am not aware of its occurrence in Asia or Africa, but in North America a closely approximate species has been found on the rocky mountains, which is, however, considered distinct by Dr. Robert Brown, who has described it under the name of *Woodsia glabella*.

This little fern is excellently figured by Bolton,* by Bauer (in illustration of Dr. Robert Brown's paper in the Linnean Transactions), and by several continental authors.

With regard to the specific name I have proposed a change, which may at first sight appear somewhat capricious, but which, when investigated, will I trust be found in accordance with the received principles of botanical nomenclature. The specific name of *hyperborea* has been applied to this plant by Liljeblad, Swartz, Willdenow, Brown, Wahlenberg, Smith, Hooker, and many other botanists; indeed it seems so sanctioned by authority, that it is not without great reluctance that I venture on the alteration which I will now attempt to justify.

The first description that I can find of this fern is that in Bolton's 'Filices': it is under the name of *Acrostichum alpinum*. "The root of this little *Acrostichum* consists of a few black, hard branches, connected to a small head, and furnished with black, hard, capillary fibres. The rib of the first leaf, when full grown, is about three inches high, of a pale brownish-green co-

* Bolt. Fil. tab. 42. The figure is so like my own that I thought it quite unnecessary to copy it, otherwise I should have done so with a view of confirming the specific name.

lour, slender and smooth, being quite destitute of hairs. Second leaves six or seven pairs, opposite below, alternate above, of a triangular figure, obtuse at the corners of three or four of the lower pairs, but all of equal size and remote, two or three of the upper gradually lessening and growing closer together. Lobes of the second leaves most commonly five, two on each side of the rib and one at the end; they are of a roundish figure, grow close together, and are obscurely crenated round the margin. The colour on the upper side is a brownish kind of green; the underside thickly covered with a brown hairy nap. The lower figure represents one of the second leaves as it appeared when a little magnified: the seed-vessels are disposed in three or four clusters on each lobe, partly hidden among the numerous strong brown hairy filaments, by which also the whole under side of the leaf, quite to the margin, is thickly covered. The specimen above described is very exactly figured on plate 42, and is a plant so perfectly distinct from the *Acrostichum Ilvense*, in its usual state, that it seems to me unreasonable to suppose them both of the same species. The *Acrostichum Ilvense*, described in the former part of this work, page 14, and accurately figured on plate 9, was brought from Snowdon. Oeder, in 'Flora Danica,' has given an excellent figure of the same plant, tab. 391, and the figure in Pluk. Phyt. tab. 179, fig. 4 (which is cited by Linneus in Flo. Suecica, ed. 2, No. 938), agrees pretty aptly with both Oeder's and my own. But all are very different from the *Acrostichum alpinum* above described. The specimen figured on plate 42 was brought from Scotland, but the plant is also a native of South Britain, for in a volume of dried plants, collected by the late Mr. Knowlton, I have seen specimens of the same plant with this note in his own handwriting — 'From the mountains of Wales.' From these and some other circumstances I am induced to think that two species of British ferns have been confounded together under the name of *Acrostichum Ilvense*, and I believe that future observation will confirm the truth now discovered."

I have quoted the description entire, in order to remove any doubt as to the plant now under consideration being identical with that he describes, although the testimony of Brown and

Smith, who cite Bolton's name as a synonyme, might perhaps be deemed sufficient to decide this branch of the enquiry. We then arrive at the question of date. Bolton's work on the British ferns, although paged continuously, was published in two parts, the first at Leeds in 1785, the second at Huddersfield in 1790; *Acrostichum alpinum* occurs in the second part.* The name of *Acrostichum hyperboreum* was published by Liljeblad in the Stockholm Transactions for 1793, and is the authority quoted by Smith and others. Mr. Bennett has, however, shown me that the original description may be dated one year earlier: admitting this, we must still give Bolton a priority of two years, quite sufficient to decide a question of nomenclature, yet it is somewhat remarkable that Lamarck and Decandolle are the only authors who have adopted the specific name of *alpinum*.†

After so ample a description as that by Bolton, already quoted, it may perhaps be thought unnecessary to give one of my own, but I scarcely think myself justified in such a departure from my usual course as to omit it. The roots are black, wiry, and branched: the rhizoma is tufted, large in proportion to the entire plant, and apparently very enduring. The stems are slender and nearly smooth; they have a few small, scattered, and pointed scales, and some very slender jointed hairs, amounting in a very young state to a fine pubescence, but both these appear to be easily removed, since in nearly all the mature dried specimens I have seen they were entirely wanting: the stem is articulated, like that of the preceding species, and I have a specimen which has two joints, a circumstance which I imagine of unusual occurrence. The shape of the frond is long, narrow, linear, and pinnate: the pinnæ are perfectly separate, sometimes distant, almost invariably alternate, and in shape somewhat triangular, the angles being rounded; they are lobed, the lobes are five or seven in number and very obtuse; the first superior lobe is sometimes considerably larger than the rest, and slightly notched; the apex of the frond is pinnatifid and pointed: the margins and under surface of the pinnæ are sparingly furnished with jointed hairs. The venation is rather anomalous; no

* Bolt. Fil. 76. † Flor. Franc. ii. 567.

particular vein appears to possess a very decided superiority over the others; they are occasionally simple, but generally divided into two or three branches; they do not quite reach the margin of the pinna; and the clusters of capsules, when present, are placed at their extremity: fig. *a* represents a pinna of the present species with the capsules *in situ;* fig. *b* shows the venation, and the points of attachment of the capsules after their removal. It may also here be observed that fig. *c* represents a somewhat intermediate form from Scotland; fig. *d* another from Llyn-y-cwn; and fig. *e* a plant of the present species from Ben Lawers: the block was cut for the first edition, but represents the plant so accurately that I did not like to cancel it, although both species have been re-engraved from other specimens.

Concerning the distinctness of species so similar as this and the preceding, much difference of opinion must always prevail. It will be seen, by my quotation from Bolton, that that author strongly insists on maintaining them as species. Sir J. E. Smith also considers them distinct; he contrasts their characters in these words: "Rather smaller than the foregoing, and less upright, with a more rusty aspect. Stalk less elastic. Leaflets shorter, rounder, with more rounded lobes, and broader at the base, not quite so deeply pinnatifid. The two species appear to me to be very distinct, though similar."* Sadler gives them as distinct without a comment, but does not appear to me to distinguish them very cleverly by his descriptions.† Wahlenberg insists on their distinctness, drawing an elaborate contrast

* Eng. Flor. iv. 311. † De Filicibus Veris, &c.—p. 45.

between them.* Lastly, Mr. Wilson remarks, "I have never had the least difficulty in distinguishing these plants, the first by its ovate, the second by its oblong, pinnæ.† All these are weighty authorities, but on the other side I find others equally entitled to respect. Dr. Robert Brown observes,—"These two plants are indeed so nearly related that I find myself unable to construct for them clear specific characters, and therefore, in proposing them here as distinct species, I am, from want of sufficient materials to determine the question, rather following the prevailing opinion than my own."‡ Mr. Babington has treated them as forms of one species, and makes this observation.—"Our plants appear to form but one species, although they put on three very different appearances."§ Mr. J. Backhouse, jun., after informing me that he collected some specimens of *Woodsia* at Falcon Clints, proceeds to say,—"I brought home some specimens with roots, and when I planted them they agreed in every particular with *W. Ilvensis:* the first fronds they produced after I had planted them were quite different, and had assumed exactly the form of the Scottish *W. hyperborea*, and they are now (26th of 11th mo. 1842) changing back again to *Ilvensis*, so that I have no doubt the forms are only two varieties of the same species." Mr. S. Thompson, of York, has seen the plants in question, and quite coincides in the opinion here expressed.

* *Polypodium hyperboreum.* A præcedente abunde diversum est, idque magis glabritie sua, mollitie majori atque gracilitate, quam forma quadam constanti pinnarum. Radix eodem modo cæspitosa sed duplo tenuior. Stipes in medietate inter radicem et pinnas infimas articulo perevidenti dividitur, ad quem denique dissolvitur et adeo rudimenta ejusdem longitudinis quasi forcipe excisa relinquit; de cætero supra hunc articulum semper glaberrimus atque lævissimus, crassitie setæ equinæ, et coloris virescentis. Quoad longitudinum haud cedit præcedenti utpote interdum spithamæum. Pinnæ inferiores a se invicem distantes vel interstitiis triplo breviores, steriles vel sine fructu omnino semicirculares, utrinque glaberrimæ, valde molles et ita tenues ut fere pellucidæ: superiores sensim elongantur et pinnatifidæ evadunt, atque fructu instruuntur, utrinque glabræ excepto fructu. Fructificationis maculæ duplo triplove minores quam in præcedente, submarginales, in suprema parte frondis confluentes, pilis paucioribus et brevioribus præditæ. Etiam laciniæ pinnarum superiorum sæpius crenatæ sunt.—Flora Lapponica, 280.

† Phytologist, 74. ‡ Trans. Linn. Soc. ix. 172. § Manual, 384.

BRITTLE FERN (*natural size*).*

CYSTOPTERIS FRAGILIS, Bernhardi, Babington.

Cystea fragilis, dentata, angustata and *regia*, Smith.

Cistopteris dentata, fragilis and *alpina*, Hooker.

THE beautiful little ferns comprehended under one or other of these names are very widely distributed throughout the United Kingdom, preferring moist and mountainous districts, and rooting

* Although these fronds are drawn of exactly the natural size, they are very much below the average magnitude. I have frequently seen fronds a foot in length.

in the fissures of rocks or the interstices of stone walls, particularly, but not exclusively, in limestone districts. They are plants of diminutive size, of erect but elegant form, and of a remarkably brittle nature, whence the excellent specific name of *fragilis*. The localities are far too numerous for me to detail, but an idea of the distribution of the species may be gleaned from the following summary, in which I have taken no notice of the various names by which botanists have inclined to call it.

Lists of the ferns of the undermentioned English and Welch counties, drawn up by competent botanists, have been kindly transmitted to me, or have come under my notice, and the fern now under consideration is absent from all of them.

Bedfordshire
Berkshire
Buckinghamshire
Cambridgeshire
Cornwall
Dorsetshire
Hampshire
Hertfordshire
Kent
Leicestershire
Lincolnshire
Middlesex
Norfolk
Northamptonshire
Oxfordshire
Pembrokeshire
Sussex.

In the following counties it appears to occur very sparingly, and only on old buildings and walls.

Cheshire.—Rostherne church, Mr. Wilson.

Devonshire.—Enwick, near Exeter, Mr. Jacob.

Essex.—Layton, Mr. T. F. Forster. It will be seen, on referring to Smith's description of *Cystea regia*, that he makes the Layton plant identical with others found on Snowdon by Mr. Wilson, at Cwm Idwell by Mr. Griffith, and on Ben Lawers by Mr. Maughan.

Herefordshire.—Downton, Mr. Lees.

Nottingham.—Oxton and Bulwell churches, Mr. Sidebotham.

Shropshire.—Dripping rocks under Whitcliff, near Ludlow, Mr. Westcott.

Suffolk.—Yoxford, Mr. Ewing; Bungay, Mr. Stock.

Surrey.—Albury, Mr. Borrer.

Warwickshire.—Compton Verney, Mr. Cameron.

Worcestershire.—Breedon hill and Bromsgrove lickey, Mr. Lees.

In the following counties this fern appears widely distributed, and in certain localities it is abundant.

Brecknockshire	Lancashire
Caernarvonshire	Monmouthshire
Cardiganshire	Northumberland
Cumberland	Radnorshire
Denbighshire	Somersetshire
Derbyshire	Staffordshire
Durham	Westmoreland
Glamorganshire	Wiltshire
Gloucestershire	Yorkshire.

Throughout the Highlands of Scotland it is a very common fern, but exhibits a constant preference for walls and bridges: in the lowlands it is comparatively of rare occurrence.

In Ireland it is a rare fern. Mr. Mackay says that it occurs on "rocks and walls in the mountainous parts of the southern, northern, and western counties,"* but he gives no precise localities.

Antrim. — In the MS. notes of the late Mr. Templeton there is a record of the variety *dentata* being found by himself "on the rocks of Carrickfergus river, near the waterfall, June 11, 1811."

Down. — Mr. Thompson informs me he observed it on the Black mountain, above Tollymore park, in 1836.

Kerry.—I am indebted to Mr. Woodward for specimens from Brandon hill; he gathered it at an elevation of 3150 feet: he also observed it on cliffs above the Punchbowl at Mangerton, at an elevation of 2500 feet.

Leitrim.—Mr. Thompson has found it in this county.

Sligo. — I never saw a greater profusion or variety of this fern than near the town of Sligo, on approaching it from Manorhamilton; it occurs not only on the limestone rocks and walls, which are there very abundant, but in the hedge-rows, mingled with *Scolopendrium vulgare*.

The range of elevation is very great, extending over 3000 feet.

Ferns very similar to many of our British forms of this species occur in every country of Europe, in Northern and Southern

* Flor. Hib. 341.

Africa, in Asia, North America, and many of the islands of the Pacific Ocean: it is true that these have been frequently described as distinct species, but the evidence on the subject is at present scarcely sufficient to induce me to admit them as such.

There are many very beautiful and characteristic figures of this fern: those in Bolton's 'Filices,'* under the names of *Polypodium rhæticum* and *P. fragile*, yield to none in excellence: I think his *P. rhæticum* may be regarded as the normal form of *fragilis*.

The little ferns constituting the present group were comprised under the name of *Polypodium fragile* by Linneus and our earlier authors; Sprengel, Willdenow, Schkuhr, Wahlenberg, and other eminent botanists, make them *Aspidiums*. Bernhardi was the first to separate them from these unmanageably extensive groups, under the generic name of *Cystopteris*; Roth gave them the name of *Cyathea*, and Smith that of *Cystea*, the latter being a mere alteration from Bernhardi's prior name, because *Cystopteris* is "compounded of another established" name, *Pteris*.† The name has been spelled *Cistopteris* by several modern authors, an orthography whose evident deviation from the Greek appears to render inadmissible: in fact there is no sufficient reason for altering or modifying a name that possesses the acknowledged right to adoption on account of its priority.

My views having in more than one instance undergone considerable modification as regards the limits of species, I turned my attention to the beautiful little ferns I had previously grouped together under the name of *Cystopteris fragilis*, in the hope of discovering some characters whereby the various forms might be satisfactorily distinguished from each other. Several botanists of eminence have undertaken somewhat too readily the establishment of new species; dwarf size, imperfect fructification, or even, in more than one instance, mere accidental deformity, having furnished the chief diagnostic. Now, as in Zoology we endeavour to refer the females and young, and even individuals that have undergone mutilation, to the same species as the adult male, so would I, in ferns, rather refer specimens which appear

* Bolt. Fil. tab. 44, 45 & 46. † Eng. Flor. 285.

in any degree imperfect to some established species, expressing a doubt if I entertained one, than separate such imperfect specimens under a new appellation. In every attempt I make to establish or ascertain a species, I find it most satisfactory to dismiss entirely all such specimens, to refuse all cognizance of them, and to contrast the most perfect and most fruitful fronds only. For as in Zoology we find specific differences most satisfactorily developed in adults, so shall we also find in ferns; and if essential differences really exist, we shall be sure to see those differences more clearly when Nature has brought the objects under consideration to their highest state of perfection, maturity and beauty. Entertaining these views, I have dismissed from the enquiry — as regards the species of *Cystopteris* — not only all seedling, immature, barren or monstrous fronds, but also all those which appeared to owe their peculiarities to the varied degrees of drought or moisture, elevation, protection or exposure, or the numerous other casualties to which so hardy yet fragile a fern is by its nature subjected; and to compare those only which grew under corresponding circumstances, had arrived at a corresponding state of maturity, and possessed the stem entire to its very junction with the rhizoma. The result of a very careful scrutiny may be thus summed up. *First*, I think it highly probable that *many* species are confounded under one specific name. *Secondly*, I am unable to give my assent to the species described by Sir J. E. Smith; neither his published descriptions nor the authentic specimens named by himself sufficiently exhibiting specific differences. *Thirdly*, I consider that forms exist quite as marked and as distinct from the normal or usual form of *fragilis* as any that have hitherto received names, either as species or varieties. And *fourthly*, I find myself unable to lay down characters whereby any individual form may be clearly and distinctly ascertained. Under these circumstances I prefer treating them still as constituent parts of a single species, leaving the task of separation to abler botanists than myself, but giving the whole of Smith's descriptions at length, accompanied in every instance by the figure of a frond, carefully compared with the specimens from which his description was compiled.

I select the variety called *dentata*, as the most simple form, to begin the series.

Cystea dentata, Smith. *Polypodium dentatum*, Dickson. "Rather smaller than *Cystea fragilis*, but agreeing with it in texture, colour, and general aspect. Root tufted, small. Frond for the most part *correctly bipinnate*, a few of the lower leaflets only, in luxuriant specimens, being pinnate or pinnatifid; the leaflets are exactly ovate, or *rounded*, *obtuse*, *pointless*, copiously and bluntly serrated or toothed: their ribs wavy; their base not decurrent, though seated on a winged midrib; masses prominent, at length entirely confluent, of a uniform rich chestnut brown. I do not perceive in the younger ones that peculiar blackness which is observable in *P. fragilis*. The cover is short, jagged, concave. I have never seen it in an early state before bursting."* Sir J. E. Smith has described this species, as far as regards the leading characters of the fronds, with great accuracy; but he has made his species too lax by introducing into it a variety of specimens from Llangollen and Anglesea: these have nothing to do with Dickson's original plant, which was found in Scotland, and is the only form of *fragilis* which I could find on the northern shoulders of Ben More, where it is most abundant, descending even to the walls on the road-side between Killin and Tyndrum. Sir J. E. Smith appears to have known nothing of the plant but from a dried frond: he makes no allusion to the reflexed, drooping, and convex pinnæ of the young fronds, or the more marginal arrangement of the clusters of capsules, characters which appear of some importance.

* Eng. Flor. iv. 287.

The second variety I consider to be the typical form of *P. fragile*, as described by Linneus.

Cystea fragilis, Smith. "Fronds several together, from four to ten or twelve inches high, lanceolate, pointed, smooth, of a full though bright green, doubly or almost triply pinnate. Stalk brown or blackish, very brittle and juicy, occupying one-third or nearly half of the length of the whole, destitute of scales, except at its very base. The primary divisions or leaves are usually nearly opposite, acute, of a moderate length; leaflets mostly alternate, ovate, acute or pointed, in barren fronds sometimes blunter; their base always tapering and decurrent; they are by no means linear or oblong, nor is their margin wavy, but copiously, deeply and sharply toothed, and their substance is firm; the larger and lower ones are deeply pinnatifid, their lobes resembling the upper leaflets. Masses numerous and crowded, globular; *at first pale, but finally blackish* and confluent, covering the whole back of the frond. Cover white, flaccid, membranous, concave, irregularly jagged and torn, sometimes lengthened out into an oblong point, but soon turned back and obliterated, or forced off by the swelling, shining capsules, which, *in an early state, are often quite black, though subsequently browner.*"* In this description a discrepancy occurs in the colour of the capsules; the colour of the clusters, in an early state, is very inconstant, but generally blackish; the autumnal fronds, when in cultivation, have smaller clusters than

* Eng. Flor. iv. 286.

the vernal; the clusters also are rarely confluent; the frond itself is more minutely divided.

The third form, often found on the same plant as the preceding, is called *angustata.*

Cystea angustata. "Root tufted, or somewhat creeping, black, with long fibres and rusty scales. Fronds several, erect, twelve or fifteen inches high, of which the slender, blackish, smooth, and naked stalk occupies more than a third, sometimes nearly half; the midrib above is still more slender, and, like every other part, quite smooth, without any membranous border. Main wings or leaves bright green, from twelve to fifteen pair, of a moderate length, nearly opposite, taper-pointed; the lowermost rather shorter and more remote from the next than those about the middle of each frond; all pinnate, with a scarcely bordered midrib. Leaflets about ten at each side, alternate, lanceolate, decurrent, rather bluntly pointed, sometimes tapering at the extremity; all either deeply pinnatifid, with oblong, acute, wavy segments; or, in less luxuriant plants, slightly pinnatifid, or only wavy at the margin; the ribs of all more or less wavy. The ultimate divisions, in every instance, are oblong or linear, never dilated, rounded, or ovate; they are sometimes, though seldom, notched or cloven at the end. By this linear or oblong mode of division, and its thinner more pliant texture, the present species may readily be known from both the preceding, with which it has generally been confounded. The masses of capsules, much smaller and less prominent than in those species, always continue distinct, standing either solitary or in pairs, towards the bottom of each lobe or tooth, and are round, at first pale, subsequently brown."* The frond to which Sir J.

* Eng. Flor. iv. 288.

E. Smith refers as having been found at Gordale, in Craven, still remains in his herbarium, and is figured on the preceding page.

The fourth and last variety noticed by Smith, and one which Professor Don considers distinct as a species, is called *Cystea regia* by Smith, who supposes it to be the *Polypodium regium* of Linneus. I have carefully examined the specimens preserved under this name in the Linnean herbarium; these are three in number: — the first appears to be the normal form of *fragilis*, although the specimen is injured; the second is the species known by our cultivators as *Asplenium fontanum*; and the third is the *Polypodium dentatum* of Dickson. The grand habitat of this plant is a wall at Layton, near Walthamstow, in Essex.

Cystea regia. "Root tufted, scaly. Fronds several, from three to ten or twelve inches high, bright green, lanceolate, twice pinnate, pinnatifid, and finely cut, of a most elegant appearance, quite smooth in every part except a few membranous, torn, pointed, brown scales, at the very bottom of the stalk, which is less brittle and juicy than that of *C. fragilis*. Leaves and leaflets more generally alternate than opposite; the former with a narrowly-winged or bordered midrib; the latter ovate, obtuse, deeply pinnatifid, with elliptic, oblong, obtuse, partly cloven, or notched segments, but not elongated, linear, or wavy at the margin like *C. angustata*, neither are their ribs zigzag as in that species. Masses of capsules very copious, but small, pale, scattered, not crowded, nor do they appear ever to become confluent. In a young state each is wrapped up in a white membranous concave cover, terminating in a tapering, more or less jagged, point, nearly agreeing with *C. fragilis*, but the masses are much smaller, and the capsules of a pale brown, never black."* A sketch of a frond gathered from the wall at Low Layton accompanies the description.

* Eng. Flor. iv. 290.

Closely allied to the first of these is a small and beautiful variety found by Mr. Gibson, at Burnley, near Coln, in Lancashire; the figures at page 149 faithfully represent some fronds presented to me by Mr. Gibson. This variety produces abundance of seed, the clusters of capsules becoming confluent, and occupying the entire under surface of the frond. It should here be observed that Roth makes no less than six species of this genus, five of which appear to be referrible to the plant now under consideration.*

It is almost impossible to give a satisfactory description of a fern so variable in form.

The roots are numerous, black, wiry; the rhizoma is tufted. The fronds begin to unfold early in the spring, and appear very evanescent, generally arriving at maturity in a few weeks: a constant succession of fronds is produced throughout the summer and autumn, but all disappear with the first frosts of winter. The general form of the frond is lanceolate and pinnate; the pinnæ are also pinnate, but beyond this they appear to possess no character in common. The length of the stem is very various. The lateral veins are alternate, and each is usually divided into three or four branches, one extending to every serrature in each lobe of the pinnule. The lower detached figure in page 155 represents a pinnule, showing the veins and points of the attachment of the capsules; the figure immediately above it represents a lobe of the same pinnule; almost every vein bears a cluster of capsules near its extremity; the cluster is nearly circular, and has a loose, white, membranous involucre, attached on one side only, beneath the capsules; its margin, at the farthest extremity from its attachment, is striated, and becomes split into capillary segments, or sometimes torn in a ragged manner, and at length entirely disappears: the clusters of capsules rapidly increase in size, frequently becoming confluent, as represented at page 154, where the apex of a frond with confluent clusters is represented to the left of the cut. In cultivation I have observed that sometimes, from the plant receiving a check from exposure or improper treatment, the masses remain of small size, and covered with the involucre, even after the frond has withered.

* Roth, Flor. Germ. iii. 93. See Appendix E.

WILSON'S FERN (*natural size*).

CYSTOPTERIS MONTANA, Link.

THIS very elegant and interesting fern has only occurred in one British locality, as described below.

FORFARSHIRE.—Mr. Wilson has kindly handed me the following notice of its discovery.—"I found this fern on Ben Lawers, while botanising in company with Professors Hooker and Graham, in August, 1836. I do not think it probable it could have been introduced by accident, much less by design. It grows in a part where *Saxifraga rivularis* is or was occasionally found, but so rarely that I never saw it but once, when Sir W. J. Hooker pointed out a starved and scarcely intelligible plant: the scar-

city therefore of the fern is no argument against its being truly indigenous. I gathered all the fronds I saw, but left the root, and think that I could find it again. Not being acquainted with the species I preserved it unnamed, until I happened to see the Cryptogamic collection of Mongeot and Nestler, and was at once struck with their *Aspidium montanum* as being identical with my new fern." I have also to acknowledge my obligation to Mr. Wilson for the loan of several fronds, thus affording me the opportunity of making an exact figure; and also to the Botanical Society of London for the loan of a specinen presented by Mr. Wilson.

The geographical range of this beautiful fern appears to be very extensive. It occurs in Norway, Sweden, Germany, Hungary, France, Italy and Spain. I am indebted to Mr. Ward for a very perfect specimen, gathered in Norway, by my late lamented friend Mr. William Christy. Mr. Smith, of the Kew Botanic Garden, has shown me specimens from the Western States of North America: it is generally described as occurring on rough or stony ground, sometimes in woods and in *subalpine* regions: 2700 feet is given as its elevation.

There is an excellent figure of *Cystopteris montana* in Schkuhr,* but with this exception I do not recollect seeing a good representation of it.

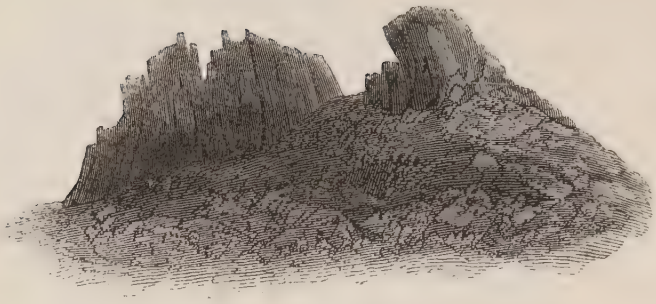
The specific name of this plant has undergone no change as far as I am aware, but as our authors have aimed at the subdivision of groups it has been repeatedly provided with a new generic appellation. Hoffman made it a *Polypodium;* Swartz, Schkuhr, Sadler and Decandolle an *Aspidium;* Sir J. E. Smith (in the 'Turin Transactions') and Roth a *Cyathea*, a genus synonymous with the earlier one of *Cystopteris*, in which it is now generally placed.

The roots and rhizoma I have never seen; the latter is figured by Schkuhr as creeping: the stem is long, slender, erect, and has a few scattered scales, more especially near the base: the figure of the frond is triangular, and much resembles that of *Polypodium Dryopteris* or *P. calcareum;* it is pinnate, the first

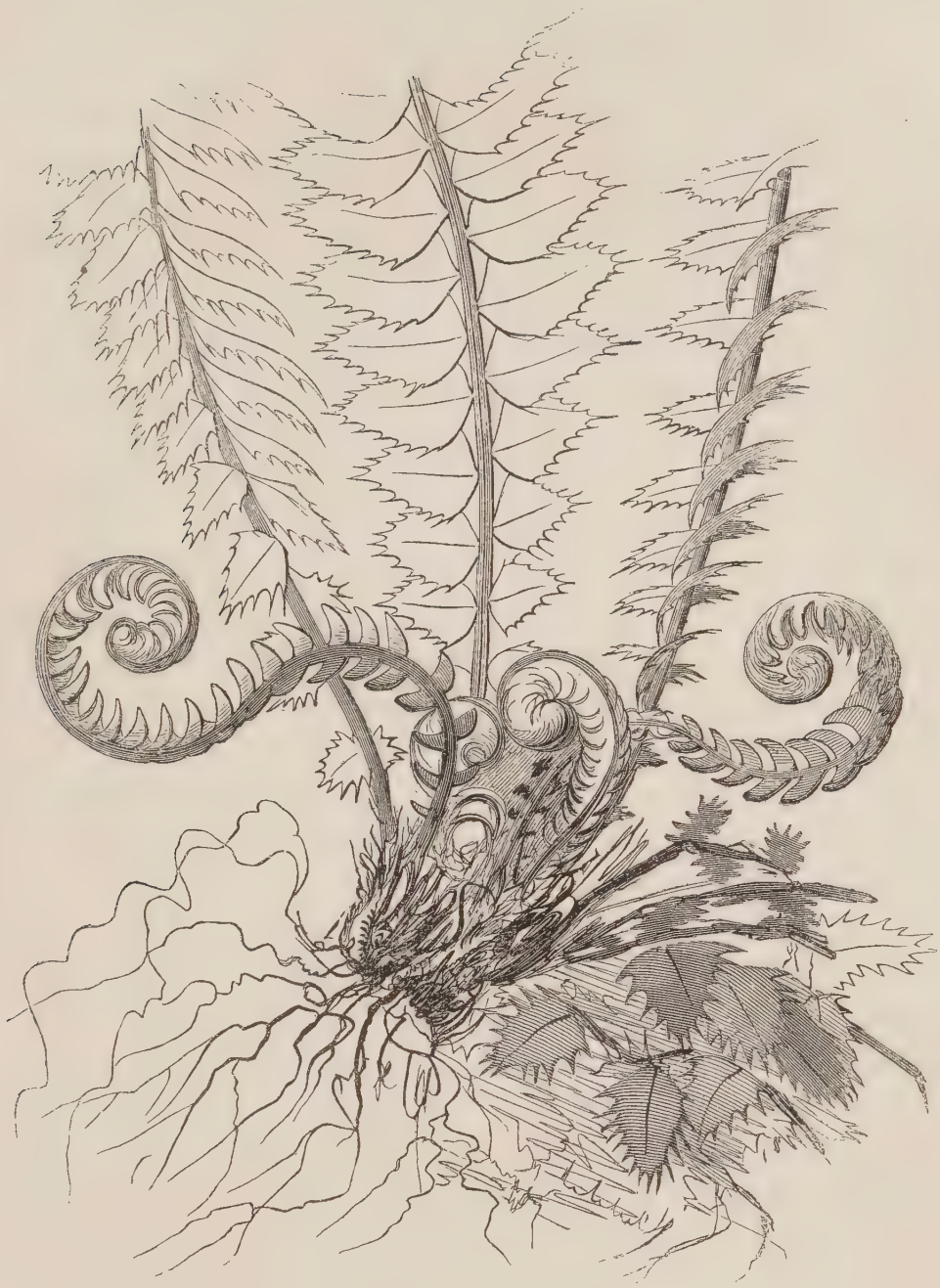
* Schkuhr, t. 63.

pair of pinnæ being, as in the species just named, nearly opposite, and very much larger than any of the others, indeed nearly equalling in size all the rest: these pinnæ are pinnate, the pinnules also pinnate; the lobes deeply pinnatifid, and their divisions also notched: it is, therefore, one of the most compound of our ferns, in this respect equalling even the Common Brakes: the second pair of pinnæ are nearly opposite, but the remainder gradually become alternate. The first inferior pinnule of the lower pair is very much larger and more divided than the first superior pinnule of the same pair; this disproportion decreases gradually, until, at the apex of the pinna, its opposite pinnules nearly correspond in size.

All the specimens found by Mr. Wilson were without fruit, but this is an evident departure from the usual character of the fern, the entire under surface being commonly covered with clusters of capsules. Mr. E. Forster has very kindly lent me, for the present work, a Swiss specimen, which is just in that state of incipient fructification which best displays its characters, and in every respect the similarity to that of *C. fragilis* is very close. The lateral veins are alternate; each generally ceases in a sinus between two serratures: the involucre is attached at the back of each lateral vein, and bends forward over the capsules in the manner of a hood; its free anterior margin is jagged and uneven, and opens outwards towards the point of the serrature. The masses of capsules are nearly circular, and become very prominent when mature; although crowded, each appears to retain its individuality, and they never seem to become perfectly confluent.



Observation on the genus Polystichum. — Commencing with those simple forms of the genus *Polystichum* which are confined to the summits of our most bleak and rugged mountains, I have traced the figure and cutting of the frond to its most divided state, and have raised the latter to the rank of a species, under the name of *Polystichum angulare*, being as I suppose the *Aspidium angulare* of Willdenow, Sprengel, and Sadler. Thus, in the pages immediately following, I have reversed not only the sequence observed, but the judgment expressed, in the first edition. The latter alteration I consider of doubtful propriety; it is the result of a desire to meet the views of abler botanists than myself. This divided form appears to me the concomitant of cultivation, the denizen of our established hedge-banks, our shady lanes, and our sheltered homesteads.



HOLLY FERN (*natural size*).

POLYSTICHUM LONCHITIS, Roth, Babington.

Aspidium Lonchitis, Smith, Hooker.

THIS fern is found on our loftiest and barest mountains, apparently courting those violent blasts which appear so destructive to our less hardy species; it is by no means abundant.

Caernarvonshire. — Mr. Pinder, who found it on Snowdon and on Glyder Vawr, in both places in fruit, observes that the plants were more lax in their habit than those from Scotland, yet he found on cultivation that their character remained unchanged. Bolton records both these localities, and Hudson says it is plentiful on the mountains above Llanberis. Clogwyn-y-Garnedd, near the summit of Snowdon, and Cwm Idwell, have often been recorded as stations ; and I was successful in finding, in several localities near the last of these stations, the plant to which botanists allude : it grows just at the upper entrance of that vast fissure called Twll-du ; again, proceeding thence to the right of the fissure, one or two plants occur on the face of the rock near the spot where *Anthericum serotinum* is found, a dangerous locality by the way, requiring a firm foot and a cool head ; and again, below the fissure, on the rocks to the right.

Durham. — Mr. J. Backhouse observes that it is very fine on Falcon Clints, just where the basalt joins the mountain limestone, ten miles west of Middleton, in Teesdale.

Yorkshire.—Mr. Tatham, who has obligingly sent me a specimen, observes that it occurs sparingly on the rocks above Settle. To Mr. S. Thompson, of York, I am indebted for a second specimen from Attermire Scar ; these specimens, being small and very sparingly fruited, do not possess diagnostics whereby I can separate them from the seedling forms of *P. aculeatum*. Mr. Watson has published an opinion to the same effect.

In Scotland this fern is much more abundant, and more harsh, prickly, rigid and erect in its character. As I have every reason to believe it exists in many other localities, I give the following list under a feeling of its great imperfection.

Aberdeenshire.—Dr. Murray.—*Francis' Analysis.*

Dumbartonshire. — Mr. Gourlie informs me that he found it on Ben Voirlich, in July, 1842.

Forfarshire.—I am indebted to Dr. Greville and Dr. Balfour for beautiful specimens from the Clova mountains : Mr. Watson informs me he has found it on these mountains ; and Mr. Gardiner, in a list of Forfarshire ferns with which he has favored me, observes that it is plentiful among the rocks of the mountains, and particularly fine on those of Craig Maid in Glen Dole.

Invernesshire. — Mr. Watson informs he has found it on mountains near the north end of Loch Erright.

Moray.—Rev. G. Gordon.—*Francis' Analysis.*

Perthshire. — I am indebted to Mr. Kippist for a fine plant found on Craig-Challiach, I believe by Mr. Woods. Mr. Watson informs me he has found it on this mountain, and on Ben Lawers; and Mr. Gourlie that it occurs frequently on Ben Lawers.

Rosshire. — Mr. Stables informs me he has specimens from the Raven rock, near Castle Leod in this county.

Sutherlandshire.—Mr. Stables has found it on Ben More.

In Ireland *Polystichum Lonchitis* is a rare fern, but occurs in a few localities, of a very characteristic form.

Donegal. — Mr. Moore informs me he has found it in the Rosses and Thanet mountain passes.

Kerry. — Mr. S. P. Woodward has obligingly given me specimens from Brandon hill, on the summit of which he found it sparingly. I believe Mr. Wilson and several other botanists had previously observed it in this locality.

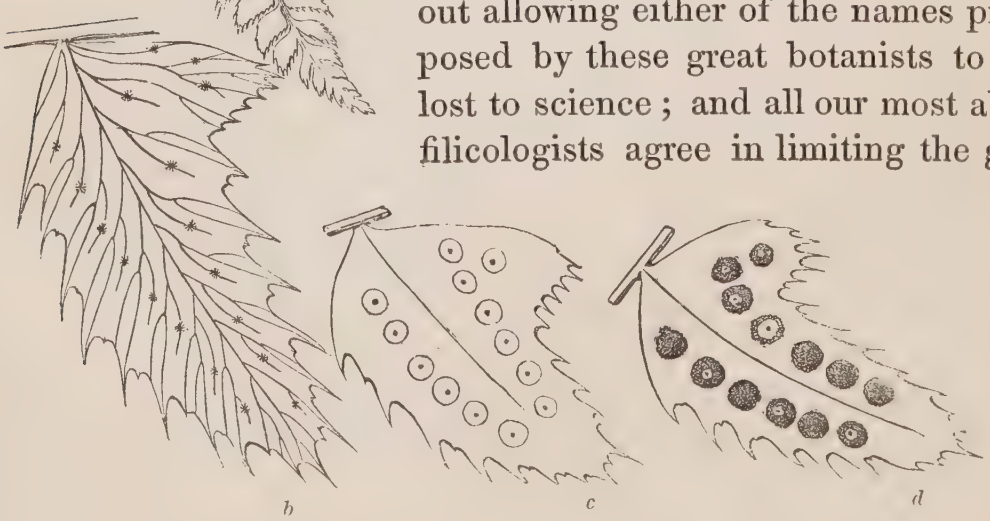
Leitrim. — Mr. Francis* gives Glenade mountain, in this county, on the authority of Mr. E. Mackay.

Sligo. — Mr. Mackay found it on Ben Bulben, in 1833; and he remarks that it had been previously found there by Mr. E. Murphy.†

The geographical range of this species beyond the limits of the British empire appears not very extensive. Sadler gives it as an inhabitant of Hungary, Germany, France, Italy and Sweden; but there is something in the expression *umbrosis alpestribus*‡ that leads me to suspect he made the species rather more comprehensive than most of our British botanists would consent to do; and Lamarck and Decandolle give its locality as *les bois montaneux.*§ Woods and shady places, in mountainous situations, are rather affected by the next species than the present. Sadler and several other authors speak of *Polystichum Lonchitis* as a native of North America.

* Analysis, 32. † Flor. Hib. 338. ‡ De Filicibus Veris, &c.—p. 34.
§ Flor. Franc. ii. 561.

Although I have entertained some doubt as to the identity of the present plant with the *Polypodium Lonchitis* of Linneus, feeling a strong inclination to refer his original specimen (which is the very counterpart of that figured on the present page, fig. *a*), to the species next described, yet I have thought it unadvisable, in the absence of positive information on the subject, to interfere with a nomenclature now received throughout Europe. The genus *Polystichum* was established by Roth in his 'Flora Germanica,' in 1800, and is so far synonymous with Swartz's genus *Aspidium*, published in the same year, that both included a long list of the same species; still the genus *Aspidium* was so vague and so extensive as almost to vie in these respects with the genus *Polypodium* of Linneus, whereas Roth very suitably separated *Cystopteris* and *Athyrium*, and made no mention whatever of the extra-European species placed by Swartz at the head of his genus. Still even Roth's genus is unmanageably large, and it becomes the duty of modern botanists to attempt subdivision without allowing either of the names proposed by these great botanists to be lost to science; and all our most able filicologists agree in limiting the ge-



nus *Aspidium* to those tropical species placed by the author as its types, and the genus *Polystichum* to the leading species *Lonchitis*, and those cognate ferns distinguished by a similar peltate involucre.

The roots of this species are long, strong, black and wiry; the rhizoma is tufted and scaly: the fronds appear early in the spring, arrive at perfection in September and October, and remain in full vigour until the following summer; the form of the frond is linear-lanceolate and pinnate. In the Twll du plant, which I have figured on the opposite page, the habit is lax and drooping. The pinnæ are crowded, and extend nearly to the base of the stem, which is covered with chaffy scales; they are somewhat crescent-shaped, auricled on the upper side next the stem, serrated and acutely spined; each pinna is twisted, a character least apparent in the Welch, and most so in the Irish specimens, in which the auricled portion of each pinna passes behind the pinna immediately above it, and projects behind the fronds almost at right angles with the stem: the Scotch specimens are intermediate in this respect. In the Welch and English plants the colour of the frond is dull green, much resembling that of *P. aculeatum*, while in the Irish, and some of the Scotch specimens, the upper surface is of a full, rich, shining green, the substance thick and leathery, and the whole frond as rigid and prickly as a spike of little holly leaves, so much so indeed that the fronds are not to be flattened for

drying without considerable difficulty. The lateral veins are alternate and generally three-branched, the anterior branch usually terminating half way between the mid-vein and margin, the others reaching the margin, but being quite free at their extremity. It should, however, be observed, that the auricle or lobe at the base of each pinna has a formula of venation decidedly different from the remainder of the pinnule, since the principal vein in this lobe emits several fruitful branches in an opposite direction to that taken by the rest. The involucre is circular, and attached to the back of each anterior branch of the lateral veins near its extremity; the attachment is by a short central cord: the capsules are attached to the vein around the base of the cord of the involucre, and, as they reach maturity, form a circular cluster, and these clusters a continuous line on each side of the pinna, about equidistant from its midrib and margin. Some specimens are so densely seeded that the masses become confluent. In the Irish, as in all other specimens, the clusters of capsules are most abundant towards the apex of the frond, but they are also scattered throughout the other parts, even to its base, whereas in the Scotch, Welch, and particularly the English specimens, the masses are confined to the upper part of the frond. Mr. Tatham, in allusion to these observations, remarks that in the Settle plant "the seed is generally confined to about a third of the frond, but I have some that are half covered."

The fronds represented at page 163 are from Scotland; those at page 166 from Wales: figure *b* shows the venation, and the points whence the clusters of capsules have been removed; figure *c* represents a pinna with the fructification in a very young state, the peltate involucre alone being visible; figure *d* another pinna, in which the clusters of capsules have swollen, and more or less concealed the involucre: the figures at page 167 are from an Irish plant.

PRICKLY FERN (*one-fifteenth the natural size*).

POLYSTICHUM ACULEATUM, Roth, Babington.

Aspidium aculeatum and *lobatum*, Smith, Hooker.

IN one or other of its forms this protean fern seems to be distributed throughout the kingdom. I have seen it more or less abundantly in every county I have visited, whether in England, Wales, Scotland or Ireland; in the last-named country, however, it is less common than in either of the others, the fern next described appearing to take its place. It seems to delight in the protection of man, its favorite locality being our hedgerows, and its luxuriance being greatly increased by cultivation, or even by proximity to cultivated lands: its occurrence on our moors, commons, and mountains, is comparatively rare, its stature diminutive, and its fronds are rigid and sparingly divided.

Its European range extends to every country except Spain, where one would rather suppose it unobserved than absent, since it occurs commonly throughout France, especially in the south,

and ascends the Pyrenees to the height of 2500 feet. It is found in Asia, Northern and Southern Africa, and North America: in the latter country it is extremely rare, but perfectly identical with our British plant.

I pass over the figures of this species, since a reference to them is rather likely to mislead under our present doubts with regard to the limits of the species.

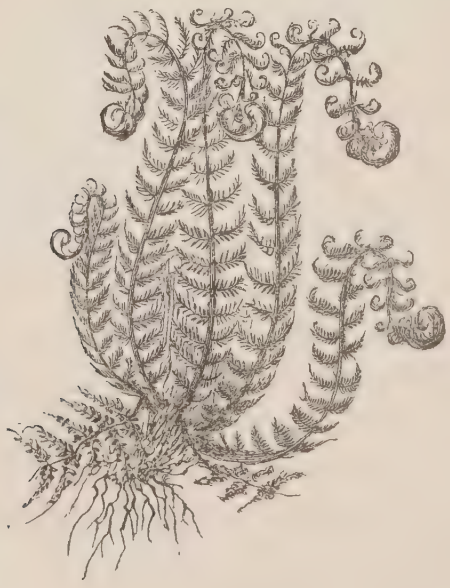
There can be no doubt that our plant is the *Polypodium aculeatum* of Linneus, and the *Polypodium lobatum* of Hudson, notwithstanding that Sir J. E. Smith separates these two by the introduction of *Aspidium angulare* of Willdenow between them; he also cites Ray, apparently in defence of his third species, but I am inclined to think that both Hudson and Ray intended to describe the two species now given as distinct, Ray's '*Filix mas non ramosa pinnulis latis auriculatis spinosis*'* being Hudson's *Polypodium aculeatum*;† and his '*Filix aculeata major pinnulis auriculatis crebrioribus foliis integris angustioribus*'‡ being Hudson's *Polypodium lobatum*.§ Ray's description of the latter species is excellent, and the admirable comparison between the two clearly shows the plants intended, although the description of the first, it must be confessed, is somewhat meagre.

The roots are unusually long, strong and tough, often taking so firm a hold of the soil—especially when the plant is growing in hedge-banks, among the roots of whitethorn or hazel — as to require great labour in removing. The rhizoma is very large, apparently increasing slowly with age, and enduring for very many years. I observe that large plants which I removed in 1837 have remained almost stationary in size, and exhibit no symptoms of incipient decay. The young fronds make their appearance in April, the circinate apex being bent backwards, and remarkably graceful in its appearance: the pinnæ of the young frond are also circinate: I have attempted, in the vignette at page 172, to give an idea of this character. The fronds attain their full expansion in July, and the seed appears to have reached

* Syn. 121. † Flora Anglica, ii. 459. ‡ Syn, l. c.
§ Flora Anglica, l. c.

maturity in September: the fronds are tough, leathery, and perfectly persistent, retaining their green uninjured by frosts throughout the year, and showing no disposition to decay until the fronds of the succeeding year are fully developed; indeed they are of so rigid and durable a character, that after changing their green hue for one of brown, they remain almost unaltered in form, and thus Nature often preserves the foliage of three or four successive years, attached to the same rhizoma, displaying to the enquiring gaze of the botanist a variation in character which will often strike him with astonishment. The form of the frond may be termed lanceolate, but it becomes more or less linear and more or less attenuated towards the base. The stem is usually very short, and is densely clothed with reddish scales; these are very large, and crowded at its junction with the rhizoma, but upwards they diminish in size, and are much smaller where the stem becomes mingled with the frond. The rhizoma has always a disposition to fix itself on a perpendicular surface, whence the fronds issue in a nearly horizontal direction, their rigid habit almost precluding the possibility of their assuming that graceful bend which is more or less observable in every other fern similarly situated. The frond is lanceolate and pinnate: the pinnæ are variously divided: when entire, as is usually the case when the plant is young (figs. *a a a*), the fronds resemble those of the preceding species, *P. Lonchitis*, from which circumstance the name of *Lonchitidoides* has been applied to this form. When the first upper pinnule is separated from the body of the pinna, which remains nearly entire (figs. *b b*), the plant becomes the *Aspidium munitum* of the continent; at least such is the opinion I gather from the descriptions of Sadler and others: when the pinna is more divided (figs. *c c c*), I suppose it to be the *Polypodium lobatum* of Hudson: and lastly, when the pinnule becomes quite pinnate at the base, and even beyond the middle (fig. *d*), it is the *P. aculeatum* of Linneus. I believe that no one who has watched the plant with careful attention has ever supposed these forms to be more than varieties of a single species. The first upper pinnule on each pinna is much larger than either of the others, indeed it is usually twice as large as the first lower pinnule; it points directly upwards towards the

apex of the frond, but owing to a certain convexity, which every division of the frond in some degree possesses, its point is bent downwards, and very frequently passes below and beyond the midrib of the preceding pinna ; the double series of these enlarged pinnules, often amounting to more than twenty, has a very striking appearance : all the pinnules have a sharp spine at their extremity, and several lesser spines at their edges, and each of the enlarged superior pinnules is slightly auricled at its outer margin near the base, and the auricle has a very strong and distinct spine towards the base of the frond ; this character extends to several of the other pinnules which most nearly approach the stem, and these are generally placed on short foot-stalks, whereas all the others are decurrent or united at the base : the direction which they assume, observable particularly in the inferior pinnules of each pinna, forms an acute angle with the midrib of the pinna. The seed is confined to the upper portion of the frond ; and in its circular involucre attached by a central cord ; in its circular clusters of capsules occasionally confluent, but generally separate ; and in the distribution of the veins, I find no characters distinct from those which I have already figured as characteristic of the preceding species.



† WILLDENOW'S FERN (*one-twentieth the natural size*).

POLYSTICHUM ANGULARE, Newman.

Aspidium angulare, Smith, Hooker.

THIS fern, like the preceding, is almost universally distributed: it is, however, confined much more exclusively to lowland regions, warm sheltered woods and hedge-rows, and seldom ascends to any considerable altitude. In some parts of Ireland it is exeeedingly abundant, and seems to take the place of *P. aculeatum*, which I consider the commoner fern in most parts of England.

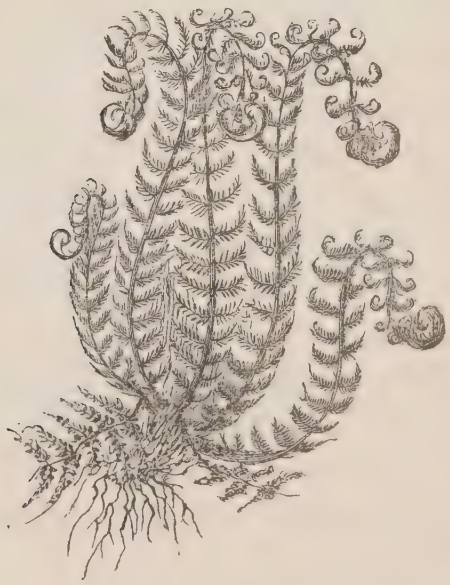
Without the means of comparing specimens, I presume, from the description which I have quoted below,* that the plant now under consideration is the *Aspidium angulare* of Willdenow.

The roots and rhizoma present no characters by which I can distinguish them from those of the preceding. The stem is distinct, about one fourth as long as the frond, and densely clothed

* *Aspidium angulare.* "A frondibus bipinnatis pinnulis oblongis subfalcatis mucronato-serratis sursum auriculatis, infima elongata subpinnatifida stipite rachibusque paleaceis. W.

"Stipes tri- vel quadripollicaris paleaceus. Rachis universalis atque partialis paleacea sed paleæ tenuiores. Frondes sesqui- vel bipedales bipinnatæ. Pinnæ tripollicares et longiores. Pinnulæ oblongo-subfalcatæ acutæ basi cuneatæ, sursum acute auriculatæ serratæ serraturis mucronatis. Pinna infima superior reliquis longior pinnatifido-serrata. Sori subrotundi. Affine A. aculeato sed præter formam pinnularum præcipue pinnula infima pinna bifida et habitu laxiore diversum. W."—Willd. Sp. Pl. 257. 91.

apex of the frond, but owing to a certain convexity, which every division of the frond in some degree possesses, its point is bent downwards, and very frequently passes below and beyond the midrib of the preceding pinna ; the double series of these enlarged pinnules, often amounting to more than twenty, has a very striking appearance : all the pinnules have a sharp spine at their extremity, and several lesser spines at their edges, and each of the enlarged superior pinnules is slightly auricled at its outer margin near the base, and the auricle has a very strong and distinct spine towards the base of the frond ; this character extends to several of the other pinnules which most nearly approach the stem, and these are generally placed on short foot-stalks, whereas all the others are decurrent or united at the base : the direction which they assume, observable particularly in the inferior pinnules of each pinna, forms an acute angle with the midrib of the pinna. The seed is confined to the upper portion of the frond ; and in its circular involucre attached by a central cord ; in its circular clusters of capsules occasionally confluent, but generally separate ; and in the distribution of the veins, I find no characters distinct from those which I have already figured as characteristic of the preceding species.



† WILLDENOW'S FERN (*one-twentieth the natural size*).

POLYSTICHUM ANGULARE, Newman.

Aspidium angulare, Smith, Hooker.

THIS fern, like the preceding, is almost universally distributed: it is, however, confined much more exclusively to lowland regions, warm sheltered woods and hedge-rows, and seldom ascends to any considerable altitude. In some parts of Ireland it is exeeedingly abundant, and seems to take the place of *P. aculeatum*, which I consider the commoner fern in most parts of England.

Without the means of comparing specimens, I presume, from the description which I have quoted below,* that the plant now under consideration is the *Aspidium angulare* of Willdenow.

The roots and rhizoma present no characters by which I can distinguish them from those of the preceding. The stem is distinct, about one fourth as long as the frond, and densely clothed

* *Aspidium angulare.* "A frondibus bipinnatis pinnulis oblongis subfalcatis mucronato-serratis sursum auriculatis, infima elongata subpinnatifida stipite rachibusque paleaceis. W.

"Stipes tri- vel quadripollicaris paleaceus. Rachis universalis atque partialis paleacea sed paleæ tenuiores. Frondes sesqui- vel bipedales bipinnatæ. Pinnæ tripollicares et longiores. Pinnulæ oblongo-subfalcatæ acutæ basi cuneatæ, sursum acute auriculatæ serratæ serraturis mucronatis. Pinna infima superior reliquis longior pinnatifido-serrata. Sori subrotundi. Affine A. aculeato sed præter formam pinnularum præcipue pinnula infima pinna bifida et habitu laxiore diversum. W."—Willd. Sp. Pl. 257. 91.

with large reddish scales. The plant appears to prefer a horizontal to a vertical surface; its habit is weak, flexible, graceful and drooping; a number of fronds issue from the crown of the rhizoma, and, when uninterrupted, spread from a common centre, presenting a very beautiful appearance: the texture of the frond is soft and delicate, its form lanceolate and pinnate: the pinnæ are very numerous, elongate, linear, distinct, often distant, drooping and pinnate; the pinnules are blunt at the apex, auricled at the base, distinctly stalked and serrated at the edges, and each serrature is armed with a spine: every part of the under surface of the fronds, more especially the primary and secondary stems, abounds in reddish chaffy scales.

When we select a specimen of this plant in its extreme state, and contrast it with a specimen of *P. aculeatum*, also in its extreme state, — when we select a central pinnule of each, and lay

them before us side by side, on a sheet of paper, the difference is so striking, that were our observations allowed no wider range, we must exercise much sophistry in inducing even ourselves to suppose them identical. The *distinctly stalked pinnules* of *angulare* (fig. *a*), set on the stem at a more obtuse angle than that of the *decurrent pinnules* of *aculeatum* (fig. *b*), offer instantly a character which it is impossible to resist: and this, added to the discrepancy in the habit, texture and figure of the frond, must lead the botanist to pronounce them perfectly distinct. It is,

however, from the constant occurrence of plants intermediate in habit, texture, figure and cutting, that the difficulty has arisen. Sir J. E. Smith has thought to solve this difficulty, by considering those forms which belong to neither species as constituting a species distinct from either. I proceed to give his descriptions.

Aspidium aculeatum. "Root tufted, large. Fronds numerous, spreading in a circle, each rather smaller than those of *A. Filix-mas*, of a dark blueish green, paler beneath, lanceolate, tapering to a point, firm and somewhat rigid, elegantly, regularly, and closely twice pinnate, with a considerable very scaly stalk; the midrib, and partial ribs also, being clothed with narrower scales, sometimes occurring still narrower, like hairs, on the backs of the leaflets. Leaves alternate, close together, linear-lanceolate, taper-pointed. Leaflets numerous, alternate, distinctly though rather shortly stalked, ovate inclining to lunate, with an oblique, acute, tapering point; the serratures few and unequal, likewise taper-pointed, the lowermost of which, at the upper edge, forms more or less of a lobe, especially in the lowest leaflet, which is rather bigger than the rest. Masses smaller and more remote than in the two last [*A. Filix-mas* and *cristatum*]. Cover orbicular, without a notch, flat, with a central protuberance when young."*

Aspidium angulare. "Softer and more delicate in texture, as well as more shaggy, than the last. The leaflets are smaller, more numerous, blunter, and rounded at the extremity, though tipped with a soft bristly point, and each of them, even to the smallest, has a broad conspicuous lobe, at the base of the upper margin; the lowest of all, at the upper edge of each main leaf, is half as long again as its next neighbour, more strongly serrated, and in its lower part generally pinnatifid. All the lobes and serratures end in soft bristly points. Stalk, and principal rib, densely covered with scales, which are narrower in proportion as they are higher up, those on the partial ribs or on the leaflets occasionally, being almost capillary. Masses numerous and crowded. Cover orbicular, for the most part entire, with a central depression. The outline of the whole frond is rather broader

* Eng. Flor. iv. 277.

than *A. aculeatum*, and the more copious, distinct, rounded, auricled leaflets give the whole a rich and elegant aspect."*

Aspidium lobatum. "This is most akin to *A. aculeatum*, *n.* 6, but Ray, in his excellent 'Synopsis,' has well marked their differences. The fronds of the present species, though nearly as long as in that, are narrower, the leaves, or pinnæ, being shorter, and they are shorter still than in *A. angulare*. They are also more crowded, especially at the base, where the foremost leaflet of each lowermost pair lies close to the main rib, and is so much larger than any of the other leaflets, as to leave no vacancy along the middle part of the frond, sometimes overlaying the rib itself. The leaflets in general are rather larger than in either of the foregoing, more pointed, and of a firmer texture, as well as of a lighter or paler green, more polished, and less hairy, the main rib only being scaly, the partial ones but slightly so towards the base. The decurrent character of the leaflets was first pointed out to me by Mr. D. Turner."†

Sir W. J. Hooker retains all these species, but adds a doubt as to their distinctness. His descriptions are as follow.

A. lobatum. "Fronds oblong-lanceolate bipinnate, pinnules rigid convex ovate sub-lunate acuminate aristate oblique and cuneated at the base and decurrent, the margins faintly serrated spinulose, with a distinct tooth at the base on the upper side, the one next the main rachis longer than the rest, stipes and rachis more or less chaffy, fructifications confined to the upper half of the fronds."‡

A. aculeatum. "Fronds broadly lanceolate bipinnate, pinnules subrigid somewhat convex slightly petioled ovato-sublunate acuminate or acute aristate obliquely truncate and auricled at the base on the upper side, the one next the main rachis somewhat larger than the rest, the margins distinctly serrated and spinulose, stipes and rachis chaffy, fructifications copious."§

A. angulare. "Fronds broadly lanceolate bipinnate, pinnules thin and membranaceous plane petioled ovate sublunate obtuse aristate obliquely truncate at the base with a large auricle on the upper side, the margins deeply serrated spinulose, the lowermost

* Eng. Flor. iv. 278. † Id. 279. ‡ Brit. Flor. 438. § Id.

ones often deeply pinnatifid, that next the main rachis scarcely larger than the rest (excepting in var. β.), stipes and rachis very chaffy, fructifications copious. * * Of this plant I possess specimens from Mr. Wigham, of Norwich, who was so much in the habit of consulting Sir J. E. Smith, when any difficulty occurred in the naming of a species, that I have every reason to believe the present to be the plant so called in E. Flora. It is, too, what is generally considered *A. aculeatum* by British botanists, and has hence only been placed in opposition to *A. lobatum* Sm., from which, at first sight, and in essential character, it certainly appears distinct; but after a most careful examination of numerous specimens I am compelled to say that there is a third kind, the *A. aculeatum* of E. Fl., which does partake of the characters of the other two, and which some refer to *A. lobatum*, and others as confidently to *A. aculeatum*. Hence, as it appears to me, they must all be united, or, as Smith has done, they must constitute three species. In Scotland the *A. lobatum* is very common, but I am not aware that the present species or variety is ever found there."*

Mr. Babington considers the three forms as referrible to a single species, *Polystichum aculeatum*, yet gives to each form the rank of a variety. His description is copied below.

Polystichum aculeatum. "Fronds bipinnate lanceolate, pinnæ linear-lanceolate, pinnules stalked or decurrent ovate acutely-serrate.—*Newm.* 37.—A very variable species.—α. *aculeatum*; fronds broadly lanceolate, pinnules ovate acute nearly all stalked their base auricled on the upper edge oblique on the lower, lobe next the main rachis longer. In this plant only a few of the uppermost pinnules of each pinna are confluent, most of the pinnules have a small auricle on the upper or outer side of their base, and the pinnule next the main rachis is nearly always considerably longer than the others. *Aspidium aculeatum* Sm.—β. *angulare*; fronds broadly lanceolate, pinnules rather blunt nearly all stalked their base auricled on the upper edge oblique on the lower, pinnule next the main rachis scarcely longer than the others. Here a few of the uppermost pinnules are conflu-

* Brit. Flor. 438.

ent, the auricle is larger in proportion to the pinnule and the lowest pinnule is often scarcely at all longer than the others. *A. angulare* Sm.—*γ. lobatum*; fronds narrowly lanceolate, pinnules decurrent often confluent, pinnule next the main rachis longer and larger than the others. Whole frond more rigid than in the other two varieties. Pinnules usually quite without auricles, not stalked but decurrent. Young plants often produce simply pinnate rather weak and flexible fronds, with stalked ovate or oblong simple pinnæ having their base strongly auricled on the upper edge and oblique on the lower, thus approaching the following species; it is then the *A. lobatum β. lonchitidoides* of Hooker.—These three plants are so intimately connected by intermediate forms that I cannot consider them to constitute more than one species."*

From a somewhat voluminous correspondence with British botanists, on the subject of these plants, I find there is a very general desire to maintain two species as distinct, but to omit the third or intermediate species. The characters recommended by my correspondents are very various, and would divide a series in a variety of ways, hence I feel reluctant to publish them. I must not, however, pass over in silence a very ingenious paper on this subject, which was read before the Botanical Society of London, on the 5th of November, 1841, and published in 'The Phytologist' on the 1st of December following. "The author observes that owing to the difference of opinion entertained respecting these ferns by botanists of celebrity—some considering them two distinct species, and others that they are merely varieties of one — any facts tending to bring to light their real character must be interesting; and therefore he has much gratification in making known a peculiarity of structure exhibited by each, whereby he considers all doubt as to their being distinct species will be removed.

"The two ferns, in their typical form, differ very materially from each other; and their differences have been well described by those who have written on the subject. But almost all, if not the whole of the characters which have been set down as dis-

* Manual of Brit. Bot. 386.

tinctive, are liable to be so extremely modified by different degrees of altitude, moisture, light, exposure &c. of situation, that an unpractised eye would often be quite unable to determine the species of these closely-allied plants, whence, questionless, has arisen the doubt as to their separate specific individuality. Thus, *Polystichum lobatum*, upon an elevated situation, possesses a lanceolate frond, generally very close and compact; its pinnæ overlapping each other: occasionally, however, these are distant from each other to almost the extent of their width, and the pinnulæ are more separated, so that the plant much resembles *P. aculeatum*. But *P. lobatum*, when growing in a low situation, is still more like *P. aculeatum;* its fronds, instead of being lanceolate, inclining more to ovate; its pinnulæ also are not merely serrated, but become slightly pinnatifid; indeed the plant can with difficulty be identified. These facts, and several others which might be adduced, show the slight value, in this genus, of characters derived from the outline of the frond or of the pinnæ and pinnulæ, which are all so liable to vary in this particular: it was, therefore, very desirable to endeavour to find some more constant character, by which these kindred species, if they proved species, might be distinguished one from the other; and after many hours spent in diligent examination of a great number of fronds, the author discovered a difference of venation in the two species, which he thus describes.

"'In examining the fronds of *P. aculeatum*, it may be noticed that the veins which bear thecæ are not continued, like the rest of the veins, to the edge of the pinnulæ, but each terminates either at its mass of thecæ, or at a very little distance beyond it. The same thing is not observable in *P. lobatum* (when *mature*), for the corresponding veins in this are each continued through its mass of thecæ to the very edge of the pinnule, and even in the fronds of immature plants of this species, when there is but little fructification, the same character is perceptible in the pinnulæ nearest the base of the pinnæ and of the frond — the parts which in ferns exhibit most strikingly all the characters of maturity: in a few of the terminal pinnulæ some of these veins do not reach the edge. It must not be concealed that in *P. aculeatum*, in an extremely few instances (being just what might be

It is by no means uncommon for the pinnules of this fern to become much subdivided: an extreme instance of this is exhibited below, in the figure of a pinna obligingly sent me by Mr. S. Gibson, of Hebden Bridge.

MARSH FERN (*one-ninth the natural size*).

LASTRÆA THELYPTERIS, Presl, Babington.

Aspidium Thelypteris, Smith, Hooker.

THIS fern must be considered local, but its distribution is very general: it occurs only on those boggy heaths where the soil is so moist and soft that its rhizoma can extend itself with rapidity and freedom: it is found in great abundance in such situations. The list of localities which I have received through the kindness of correspondents, is far too voluminous to publish:

I shall, therefore, only give a general summary, from which it will be observed that as regards the English and Welch counties it occupies tracts that are avoided by the ferns of mountainous regions.

ANGLESEA. — Edge of Llwydiart lake, Pentraeth. — *Rev. H. Davies' Welch Botanology.*

BEDFORDSHIRE.—Potton marshes.—*Botanist's Guide.*

CAERNARVONSHIRE.—Near Llanberis.—*Botanist's Guide.*

CAMBRIDGESHIRE. — Fulbourn, by the footpath to the mill on both sides; Feversham moors, Gamlingay.—*Mr. Relhan.*

CHESHIRE.—Newchurch bog, Over, Knutsford moor, Rostherne moor.—*Mr. Wilson.* Wybunbury bog.—*Mr. Pinder.* Harnicroft wood, near Wernith.—*Botanist's Guide.*

CUMBERLAND.—Glencoin and Blowike, Ulswater, Keswick.—*Botanist's Guide.*

ESSEX.—Epping.—*Mr. Ray.* Little Baddow common.—*Mr. Forster.*

GLAMORGANSHIRE.—Cwmbola and Sketty bog.—*Mr. Gutch.*

HAMPSHIRE.—Near Freshwater gate.—*Dr. Bromfield.*

HEREFORDSHIRE.—Centrical parts of the county.—*Botanist's Guide.*

KENT.—Ham ponds, near Sandwich.—*Mr. Ward, Mr. Kippist.* North Cray.—*Mr. H. L. Jenner, Mr. Sparkes.*

NORFOLK. — Horning, St. Faith's, Upton, Filby, Holt Edgefield, Scaring, Felthorpe, and other fens.—*Mr. S. P. Woodward.*

NOTTINGHAMSHIRE. — Oxton and Bulwell bogs. — *Mr. Sidebotham.*

SUFFOLK. — Near Bungay.—*Mr. Stock.* Lound, Hipton and Bradwell common.—*Botanist's Guide.*

SURREY.—Near Leith hill.—*Mr. Borrer.* Near Godalming. —*Mr. Salmon.*

SUSSEX.—Albourne and Amberley.—*Mr. Borrer, Mr. Jenner.* Near Tunbridge wells.—*Mr. Jenner.* Waterdown forest.—*Mr. Pamplin.* Ore, near Hastings.—*Mr. Woods.*

WARWICKSHIRE.—Formerly near Allesley.—*Rev. Mr. Bree.*

WESTMORELAND.—Hamersham bog.—*Mr. Pinder.*

YORKSHIRE.—Potterie car.—*Mr. Hardy.* Askham bog, Heslington fields and Terrington car.—*Mr. S. Thompson, &c.*

In Scotland it does not seem of common occurrence: some of the few localities which have reached me have turned out on investigation to have originated in mistake, a small form of *Lastræa Oreopteris* having been taken for the present plant. Through the kindness of Scotch botanists I have received very careful lists of the ferns of Argyleshire, Dumbartonshire, Dumfriesshire, Kirkcudbrightshire, Lanarkshire, and Renfrewshire, and from all of these it is absent. I am indebted to Mr. Watson for the information of its occurrence in Forfarshire, on the authority of Mr. R. Maughan; Mr. Watson adds "not in fruit, but I believe the name correct."

In Ireland it seems equally uncommon: through the kindness of Mr. W. Thompson I have received the following extract from the MSS. of the late Mr. Templeton, respecting this fern—"plentiful among woods and bushes in the low part of Portmore park, on the side of Lough Neath, county Antrim." Mr. Moore informs me he has subsequently found it on the same spot. Near Lough Carra, county Mayo. — *Mr. J. Ball.* Marsh near Mucruss.—*Mr. Mackay.* Captain Jones informs me he subsequently found it at this station, but several botanists have lately sought diligently without success.

This species occurs in every country in Europe. In Asia, Africa, and South America, it is said to have been found, and I am indebted to Mr. Boott for both fronds and living plants from the United States, which are so similar to our British plant that I am unable to detect any character by which to distinguish them.

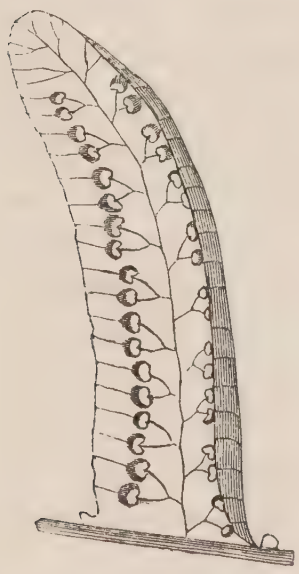
It is rather a remarkable fact in connexion with the history of this fern that it has never been represented in 'English Botany,' the figure which bears its name* being, as already stated, evidently drawn from a specimen of *Polypodium Phegopteris.* Bolton made a somewhat similar mistake, by figuring *Lastræa Oreopteris* in its stead,† but this he subsequently rectified by repeating the species under its proper name;‡ his second figure is a very good one.

Botanists seem scarcely agreed as to the genus to which this fern should be referred. Presl places it in Bory's genus *Las-*

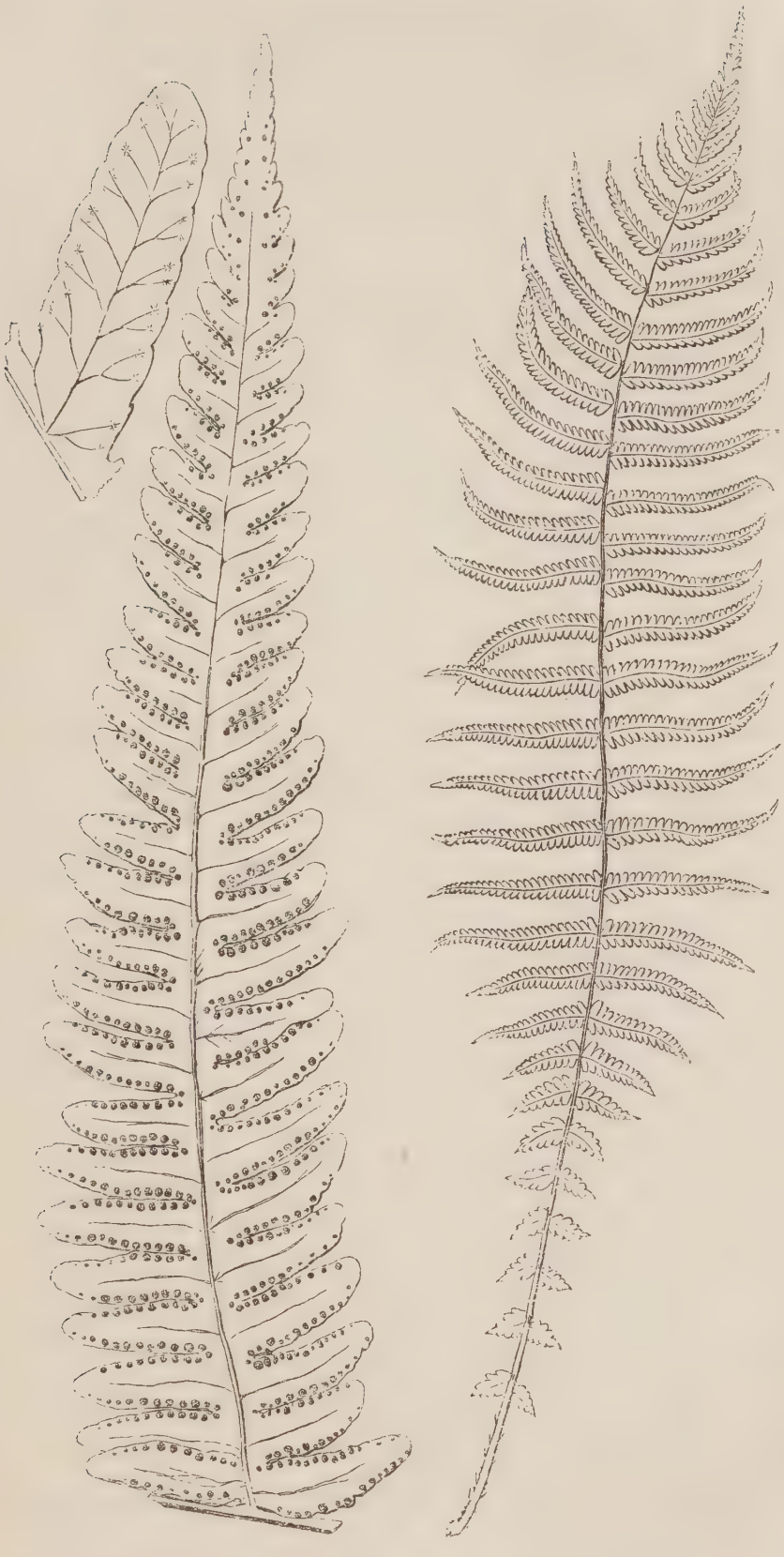
* Eng. Bot. 1018. † Bolt. Fil. tab. 22. ‡ Id. tab. 43.

træa; Schott constitutes a genus (*Thelypteris*) purposely to receive it, and gives to the species the name of *palustris*; and Sir W. J. Hooker, in the fifth edition of his 'British Flora,' makes it an *Aspidium:* thus we have three of the highest, as well as most recent authorities, completely at issue on the question.

The roots are black and fibrous; the rhizoma slender, black, and rapidly creeping. The fronds are of two kinds, barren and fertile; the barren appear in May, the fertile in July: the pinnules of the young frond stand out at right angles with the stem. The stalk of the barren frond is long, smooth and erect; the frond lanceolate and pinnate; the lowermost pinnæ are rather shorter than the second, third or fourth pairs, still not materially shorter, and always situate a long distance from the base of the stem: the pinnæ are generally nearly opposite, distant, linear, slightly drooping and pinnatifid; the pinnules crowded, entire and rounded at the extremity: the habit is slender, delicate, and very fragile; the texture thin and almost membranaceous; the colour pale green. The fertile frond differs in being much more tall and robust and in having the margins of the pinnules convolute, and the pinnules themselves are thus rendered narrower and apparently more distant.



The lateral veins of the pinnules are alternate; they are forked almost immediately on leaving the mid-vein, and each branch proceeds to the margin of the pinnule (as shewn at page 183), bearing a nearly circular cluster of capsules about midway between the mid-vein and margin: at the back of each cluster, in an early stage of the frond, may be seen a small, flat, whitish, reniform involucre, as represented in the figure in the margin; this soon withers, is pushed aside by the swelling capsules, and is lost: the clusters of capsules become confluent, and the semi-bleached semi-membranous margin of the pinnule partially covers them.



b

MOUNTAIN FERN (*the pinna b shews the natural size*).

Lastræa Oreopteris, Presl, Babington.
Aspidium Oreopteris, Smith, Hooker.

This fern, as its name implies, is an inhabitant of mountains, and is more rarely found on low ground, and very seldom in highly cultivated districts. It is particularly abundant in the Highlands of Scotland, being in many of the mountain wilds more common than *Pteris aquilina*: it also abounds in the hill districts of the north of England and Wales. It is not, however, confined to hills, since we find it sparingly in all our counties where there is waste ground: it approaches London on all sides, occurring on Wimbledon common, Hampstead heath, High Beech, and Blackheath. Notwithstanding its apparent partiality for exposed and elevated districts, it grows more beautifully and luxuriantly in woods, especially where intersected by a little stream, on the banks of which it will often be observed in profusion. In Ireland it is very sparingly distributed: I only observed it in abundance in two spots, near Milroy bay in the county Donegal, and near Glendalough in the county Wicklow. It occurs sparingly in the Killarney district, and Mr. Moore has observed it in the county Derry.

Lastræa Oreopteris grows throughout Europe, but, according to Sadler, is confined to this continent, and I have seen it from no other part of the world: in one or two instances it has been confounded, though very injudiciously, with the *Lastræa Novaboracensis* of the United States, a perfectly distinct species.

The figures of this fern are generally good: that in Bolton, to which I have already alluded as bearing the name of the preceding species, is excellent.

This fern has received four specific names, besides that of *Thelypteris* erroneously assigned to it: it is the *Polypodium montanum* and subsequently the *Polystichum montanum* of Roth,* the *Polypodium Oreopteris* of Ehrhart and Dickson,† the *Polypodium fragrans* of the second, but not of the first, edition of Hudson's 'Flora Anglica,'‡ and the *Aspidium odoriferum* of

* Roth, Flor. Germ. iii. 74. † Trans. Linn. Soc. i. 181, 1791.
‡ Flora Anglica, 457.

Saml. Fredk. Gray's 'Natural Arrangement of British Plants :'* there is a question of priority between two of these names, *montanum* and *Oreopteris*, which appears to issue in favour of the former; this however has been rejected as clashing with *Cystopteris montana* (of the present work), formerly known as *Polypodium montanum* of Allioni : † the name of *fragrans* is objectionable, since I have good reason for believing it is not the first-described *Polypodium fragrans* of Linneus, and the name *odoriferum* is of much later date. In many of its characters this fern is so like the last that it is constantly taken for it, a circumstance which has led to a profusion of errors respecting localities. Schott places it in his genus *Thelypteris*,‡ Presl in *Lastræa*,§ and Hooker in *Aspidium*.‖ Its nearest ally among British Ferns appears to me to be *Polypodium Phegopteris*, and its connexion with the species of *Aspidium*, *Polystichum* or *Lastræa*, is by no means evident.

The roots of this fern are numerous, strong, tough and penetrating; they appear to spread in every direction from a large, scaly, tufted rhizoma, which yearly increases in magnitude. In favorable situations this sends forth thirty or forty fronds, which spread with but little regularity round a common centre : immediately these begin to unroll they exhibit the pinnæ, placed at right angles with the main stalk, and are not convolute as in the allied ferns, a character worthy of particular notice, because unusual among our ferns. The fronds, when fully expanded, are very variable in size, dependant chiefly on situation, but also in great measure on the age of the plant. An extraordinary number of seedlings are met with where this fern is abundant : these for two or three years bear little or no fruit, but after the third year fructification appears in abundance, and from that period all the fronds are fertile. Ray thought the seedling a distinct species;¶ Smith appears to dissent from this, but gives it as a variety.** In the figure of the frond there is little or no

* Nat. Arr. ii. 6.

† Allioni, Flor. Ped. n. 2410. ‡ Schott, Genera Filicum.

§ Tentamen Pteridographiæ, 76. ‖ Brit. Flor. 439.

¶ Filix pumila saxatilis altera Clusii.—Syn. 122.

** *Aspidium Oreopteris*, β.—Eng. Flor. iv. 274.

variation; it is elongate, lance-shaped, regularly pinnate; pinnæ acute at the apex, and gradually diminishing from about two-thirds of its length to the very base, the lower pinnæ being remarkably short and nearly triangular in their form: this attenuation of the frond towards the base is an excellent diagnostic (see the left hand figure, page 187), and is alone sufficient to distinguish the present from any other British fern. There is but a very small portion of stem below the pinnæ, and this is nearly hidden by pale brown scales. The pinnæ are linear and acute at the apex, rather distant, deeply pinnatifid, and attached to the main stem only by their midrib. A separate pinna is represented of the natural size at page 187. The pinnules are rounded and slightly crenate; over the entire under surface are scattered small, yellowish, glandular globules, which are adhesive to the touch, and emit a powerful but not very agreeable odour: it is probably in consequence of this property that the species has been so commonly supposed to be the *Polypodium fragrans* of Linneus.

The veins in the pinnules of *Oreopteris* are alternate, and are either simple or branched; in the latter case both veins are fruitful, as in *L. Thelypteris*: sometimes the veins or branches are again divided just before their termination, and then each of the subdivisions is usually fruitful; all the veins and branches cease just before the margin of the pinnule: the clusters of capsules are circular, and are placed very near the extremity of each vein, so as to form a nearly marginal series. In some instances, but by no means generally, a small, torn, white involucre is to be seen near the centre of each cluster of capsules, as represented in the margin. This involucre is said to be reniform, a character I have never been able to detect: in general the masses are perfectly naked, even before the frond has unrolled, and the plant presents every appearance of being a true *Polypodium*.

RIGID FERN (*one-fourth the natural size*).

Lastræa rigida, Presl, Babington.
Aspidium rigidum, Hooker.

This beautiful and very distinct species was added to our British Flora in 1815, by the Rev. W. T. Bree. It seems entirely confined to limestone rocks in mountainous districts, and has hitherto, as far as regards Great Britain, only been found in three English counties.

Lancashire. — It was found by the Rev. J. Smythes, near the top lock of the Lancaster and Kendal canal.*

Westmoreland. — Mr. Simpson informs me he found it "in great profusion growing out of broken limestone, on the declivity of a hill just by the border of Lancashire:" he observes, "I never saw any fern in such masses, several hundred fronds being together in a compact bundle, so much so indeed that when I had pulled two hundred no diminution of the quantity was observable." Miss Beever, in a letter of a subsequent date, says it grows "most profusely on and near Arnside Knot." Mr. Pinder, at a still later period, writes thus: "I met with *Lastræa rigida* in great profusion along the whole of the great scar limestone district, at intervals between Arnside Knot, where it is comparatively scarce, and Ingleborough, being most abundant on Hutton Roof crags and Farlton Knot, where it grows in the deep fissures of the natural platform, and occasionally high in the cleft of the rocks; it is generally much shattered by the winds, or cropped by the sheep, which seem to be fond of it. With regard to the shape of the frond, I may mention that among some hundreds of specimens I found but one or two which agreed with your figure [see the right hand figure, p. 191] drawn from an Ingleborough specimen, all mine being more or less triangular [see the left hand figure], and not having the lower pair of pinnæ shorter than those in the upper and middle part of the frond: the fronds of young plants are remarkably triangular. The two forms of frond no doubt depend upon the situation, whether sheltered or otherwise, and on other causes,

* Phytologist, 478.

still I imagine the triangular to be the true form of the plant, having been informed by a person resident in the neighbourhood that the plant from Ingleborough assumes the triangular form in cultivation. I do not know whether it has been recorded that this fern possesses a slight scent, not at all unpleasant, but strikingly different from that of other ferns."

YORKSHIRE. — The Rev. Mr. Bree first found this fern on Ingleborough, near the foot of the mountain: it has since been found in the same locality by Mr. Pinder. Mr. Tatham informs me "it grows abundantly in the fissures of limestone rocks, at an elevation of 1550 feet above the level of the sea, and 1050 feet above the town of Settle: in company with it are found *Asplenium viride* and *Polystichum Lonchitis*, the latter sparingly."

I have to acknowledge my obligation to all the botanists mentioned for specimens from the various localities, with the exception of that in Lancashire.

Sadler gives this species as an inhabitant of Hungary, Germany, France and Italy, but he excludes it from Britain, Scandinavia and Spain. It occurs in Siberia, but I am not aware of its having been found in Africa or America.

There are but few figures of this fern: that in Schkuhr is admirable; those in 'English Botany' * and in Mr. Francis's work † are not to be spoken of in terms of praise.

With regard to the name of this fern I have long suspected we are in error. I am quite inclined to believe it identical with that originally described as *Polypodium fragrans* by Linneus. The first description by Linneus answers well for the present plant; — "Fronds sub-bipinnate lanceolate, pinnules crowded, their lobes obtuse, serrated, stalk scaly:"‡ and he adds, as if to enforce the character of the serrated lobes, "It has the habit of *Filix-mas* but is much less, the pinnules are more thickly crowded, their lateral lobes obtuse and more deeply serrated."§ Linneus also quotes Amman's *Dryopteris rubum idæum spirans*,

* Eng. Bot. 2724. † Analysis, Pl. iii. fig. 5.

‡ Polypodium frondibus sub-bipinnatis lanceolatis: foliolis confertis: lobis obtusis serratis stipite paleaceo.—Sp. Plan. 1089 of the 1st edition.

§ Habitus P. F. maris at longe minor. Foliola densius congesta, lobis lateralibus obtusis profundius serratis.—Id. l. c.

which is an excellent description of this species; and the Linnean authentic specimen, although very small and in a wretched state, has no character that contravenes such a conclusion, while the remarkable involucres (some of which are still in good preservation, and closely agree with that figured at page 191), and the toothed but not spined divisions of the pinnules, are rather in favour of its being a dwarf individual of that species. Hudson, in his first edition, quotes the description by Linneus in the 'Species Plantarum,' and gives as its only habitat "the moist fissures of rocks near Keswick, in the county of Westmoreland."* Thus far all the evidence appears in favor of the supposition that the *Polypodium fragrans* of both authors was the *Lastræa rigida* of the present work; and it may be remarked, in allusion to the small size which is insisted on by Linneus and by Amman, and is observable also in the Linnean specimen, that the average height of this fern on the continent is nine or twelve inches, and that Sadler gives its height in Hungary at half a foot to a foot. We must now place the subject in another light. In his 'Mantissa,' a work of the highest authority, we find Linneus giving a second description of *Polypodium fragrans*, from a French specimen, totally at variance with that in his 'Species Plantarum;' it is as follows: "Fronds bipinnate, pinnæ ovate sublobate obtuse, beneath naked, the margin reflexed and the fructification marginal."† In this description it appears to me that the obtuse pinnæ (evidently pinnules) naked beneath, with reflexed margins and marginal fructification, are the characters of *Lastræa Oreopteris;* few botanists have gathered *Oreopteris* without observing that the margins of the pinnules if not originally reflexed almost immediately become so. Hudson, in his *second* edition, gives this *second* description as his character of the plant,‡ so that we are left in the pleasing belief that in the first instance both authors described *rigida*, in the second both *Oreopteris*. Abler botanists must hereafter decide what course is to be

* Habitat in rimis petrarum humidis prope Keswick in comitatu Westmorlandico.—Flora Anglica, 388 of the first edition.

† Polypodium frondibus bipinnatis: pinnis ovatis sublobatis obtusis subtus nudis, margine reflexis, fructificationibus marginalibus.—Mant. ii. 307.

‡ Flora Anglica, ii. 457 of the second edition.

adopted in the nomenclature; for the present I adhere to that I have previously employed. It may also be mentioned that the present plant appears to be the *Polypodium fragrans* of Villars' plants of Dauphiné,* (although Swartz thinks otherwise, and has redescribed Villars' plant under the new name of *Villarii*), and the *Aspidium fragrans* of Gray's 'Natural Arrangement of British Plants:' † with respect to the latter author, it should be particularly observed that his *Aspidium fragrans* is not to be supposed identical with either *Thelypteris* or *Oreopteris*, since both these species are also described, the former under the name of *palustre*, the latter under that of *odoriferum*. In Hooker and Greville's 'Icones Filicum'‡ the name of *Nephrodium fragrans* is given to a fern collected by Captain Parry during one of his arctic voyages, and the Linnean name of *Polypodium fragrans* is given as a synonym. The Rev. W. S. Hore informs me he has a specimen of a similar fern, collected by Mr. Griffiths on Melvill Island. Miss Beever has obligingly sent me the following quotation from one of Rousseau's 'Lettres sur la Botanique.'—"Je crois me rappeler par exemple qu'il le trouve quelques fougères, entre autres le *Polypodium fragrans* que j'ai herborisé en Angleterre, et qui ne sont pas communes partout." Rousseau's residence in this country being Wootton Hall, in Staffordshire, this fern was probably *L. Oreopteris*. *Lastræa rigida* of this work is synonymous with *Polystichum strigosum* of Roth.§

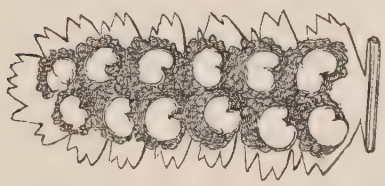
The roots are long, and the rhizoma large and tufted: the stem is unusually thick at the base, and is very densely clothed with large red scales, which are present, though less abundant, throughout its entire length; the proportion of the stem to the frond varies betweeen a fourth and half: the frond is nearly erect, pinnate, and is in habit a good deal like *L. Filix-mas;* its form is variable, as I have already shown by the quotation from Mr. Pinder's letter; the extreme of the lanceolate and triangular form are shown in the two figures: the pinnules are more or less crowded; those towards the base are more distant

* Histoire des Plantes de Dauphiné, iii. 843. † Nat. Arr. ii. 9.

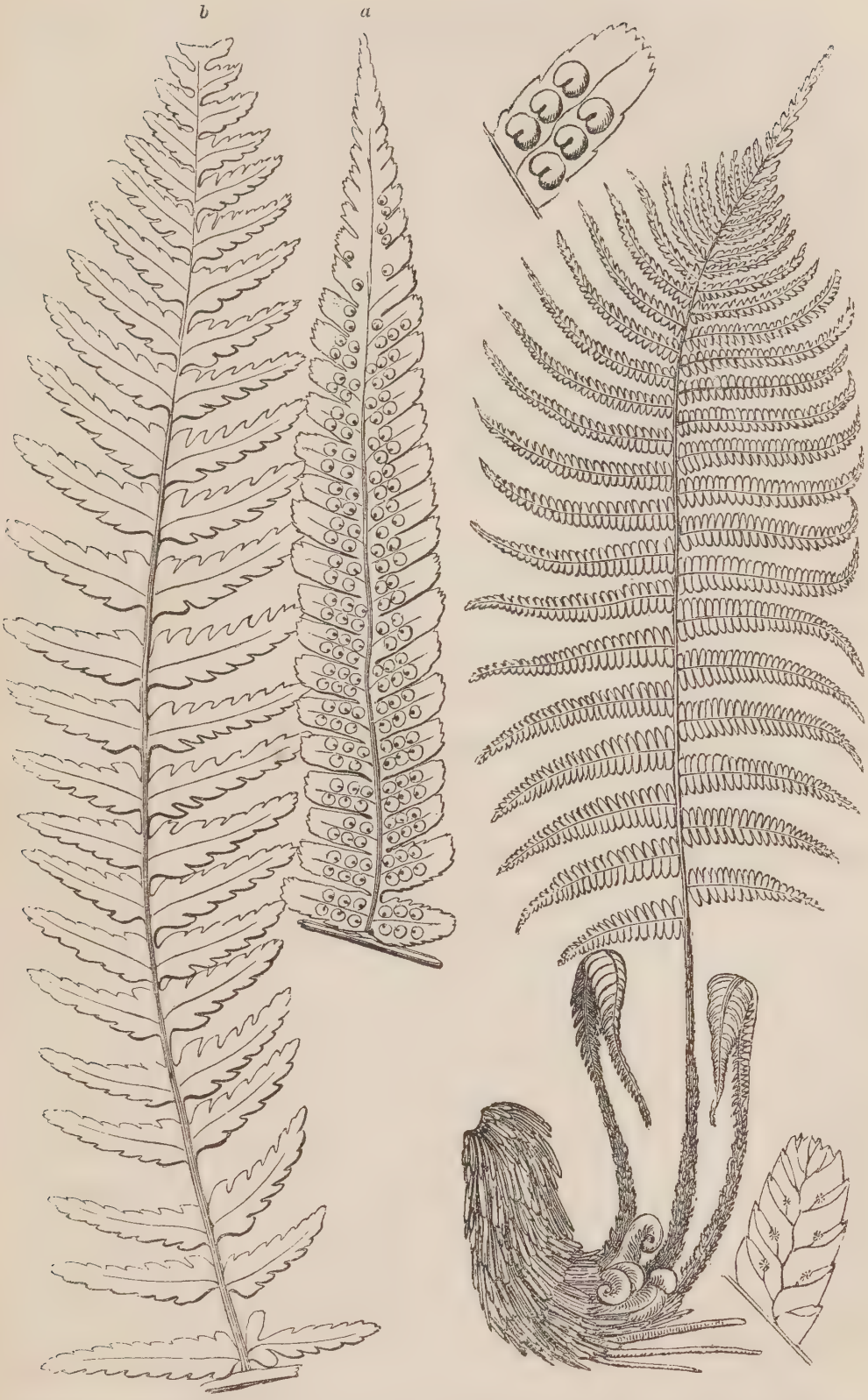
‡ Icones Filicum, vol. i. tab. 70. § Roth, Flor. Germ. iii. 86.

than those in the middle and upper part of the frond, they are also sometimes shorter and somewhat triangular, but this character appears rather the exception than the rule, for in the specimens so kindly and liberally supplied me, I find by far the greater number have the first pair of pinnæ fully as long as either of the others: all the pinnæ are pinnate; the pinnules are somewhat stalked, and so deeply divided into lobes as to

appear almost pinnatifid; the lobes are toothed, the teeth *being without spines.* This character I consider of importance as offering an excellent diagnostic whereby readily to distinguish the present species from the whole tribe of crested ferns, with which it appears to have been formerly confounded. The mid-vein of the pinnule is waved; the lateral veins are alternate, and each is forked almost immediately after leaving the mid-vein: the posterior branch is again divided, and each ramifies into a serrature of the lobe: the anterior branch bears a circular cluster of capsules about midway between the mid-vein and margin; these masses, which are ten or twelve in each pinnule, are almost approximate, and finally become completely confluent; each of the masses is covered by a reniform



lead-coloured involucre, which is attached to the vein by a short stalk placed in the lateral notch. The upper figure in the margin shows the veins and the points of attachment of the capsules; the lower figure shows the clusters of capsules with their involucres in the natural situation. The involucre is furnished with a fringe of stalked glands, as represented at page 191. Over the upper surface of the frond are scattered numerous minute, spherical, and nearly sessile glands; from these, in all probability, is emitted the scent which has caused so many authors to call this plant by the name of *fragrans.* Mr. Pinder called my attention to these glands; he informs me they are more conspicuous in the living than the dried plant, and impart to it a glaucous hue.



MALE FERN (*the pinnæ a and b show the natural size*).

LASTRÆA FILIX-MAS, Presl, Babington.

Aspidium Filix-mas, Smith, Hooker.

This is a most abundant species, and one which seems to delight in wooded and cultivated districts: although scattered over every part of the kingdom, it is ever most abundant in rich soil and shady situations: it lives to a great age, and the fronds of each succeeding year appear to increase in size.

It is found in every country of Europe, and is widely distributed in Asia and Africa. Beck gives it as a native of North America, but it does not occur in either of the collections I have seen from the United States.

The figures of this fern are generally tolerably accurate, but it requires a little nicety in the drawing to make it perfectly distinguishable from two or three others which approach it in general outline.

The name of *Filix-mas* or *Male Fern* seems to be ascribed to the present species by universal consent. Gerarde, Ray, and all our earlier authors, give it one or both of these designations. This species may be considered the best illustration of Bory's genus *Lastræa*, and possesses the most perfect example of a reniform involucre that is to be found among British ferns.

Its medicinal properties were formerly highly extolled. All our ancient herbalists agree as to its value as a vermifuge: Tragus prescribes the root for this purpose,* and Gerarde, quoting the authority of Dioscorides, writes thus. — "The root of the Male Ferne, being taken to the weight of halfe an ounce, driveth forth long flat worms as Dioscorides writeth, being drunke in Mede or honied water, and more effectually if it be given with two scruples or two third parts of a dram of Scamonie or of black Hellebore: they that will use it must first eat Garlicke. The root hereof is reported to be good for them that have ill spleenes, and being stamped with swines grease and applied it is a remedy against the pricking of the reed."† Tragus has a very curious passage on the subject of its curing wounds inflicted by reeds, and says, that so great is the antipathy of the Male Fern and the reed to each other, that where one grows the

* Radix in pulverem redacta et pondere iii drachmarum ex aqua mulsa latos lumbricos ex vino vero sumpta longas at teretes tineas pellit.—Tragus, 547.

† Ger. Em. 1130.

other will not. The same author recommends a piece of the root of this fern to be laid under the tongue of a horse that has fallen sick from any unknown cause: by this application the disease will be expelled, and the horse recovered.* Independently of these quaint accounts we learn that the root was formerly employed somewhat extensively in medicine; but the result of my enquiries on this subject is, that the Male Fern has long since ceased to be a plant of importance to the apothecary in this country, although still in considerable use in Switzerland.

Schkuhr says that this fern, together with its roots, is used in dressing leather, and the ashes in bleaching linen and in the manufacture of glass. In Norway its fronds serve as fodder for oxen, horses, sheep and goats: when dried it furnishes good litter for cattle, and when decayed is a valuable manure.

"Formerly," continues the same author, "this fern and its root were applied to many superstitious uses, since divers vagabonds prepared from the latter, together with its young incurved and yet unexpanded fronds, the so-called *Lucky-hands* or *St. John's hands*, which they sold to ignorant and credulous people, both in town and country, as preservatives against witchcraft and enchantment. This still goes on in our own enlightened time, and it is a great scandal to Christianity that many men believe more in such things than in anything else. Only a few years ago a clergyman's wife in this neighbourhood purchased one of these St. John's hands for four shillings, and I have known others buy little bits cut from such a hand for four to eight groschen, to be given in drink to their cattle, as a means of protecting them against enchantment and witchcraft: it is a pity that such remedies will not also protect us against death."† Tragus also informs us that some of the uses to which this fern were formerly applied are too scandalous to relate. It is very amusing to find almost every one of these old botanists bewailing the wickedness and credulity of times gone by, yet recommending

* Quod si equus considerit nesciaturque qua ægritudine laboret particula hujus radicis, linguæ eius subijciatur, quo facto equus confertim utrinque dejicit recrementa, rursusque consurgit id quod ipse ita se habere comperi.—Tragus, 547.

† Schkuhr, p. 46.

herbs for the most improper uses, or assigning to them the most marvellous powers: our old friend Gerarde, after many a kind warning to his readers against credulity, winds up his 'Herbal' with an avowal of his implicit faith in the Bernacle goose.

The roots are extremely strong and tough; they are of a dark brown colour, and penetrate very deeply into the earth; the rhizoma is tufted: if in a favorable situation it elongates slightly every year, so that in very old plants it makes a decided appearance above ground, and the crown of the rhizoma, whence spring the fronds, appears to be seated on a short stem; it more often, however, assumes a pendant position, as represented at page 197, the crown of the rhizoma curving at the extremity, and the fronds growing in a nearly erect position. This elongation of the rhizoma in *L. Filix-mas* (a character still more decided in *Athyrium Filix-femina*), affords us a clew to that erect and elongated part which is called the "trunk" of Tree Ferns. It is inconsistent with analogy to suppose that genera, which are so obviously allied in every other character, should be so totally different in this, as for one to possess a trunk and the other to be entirely without it.

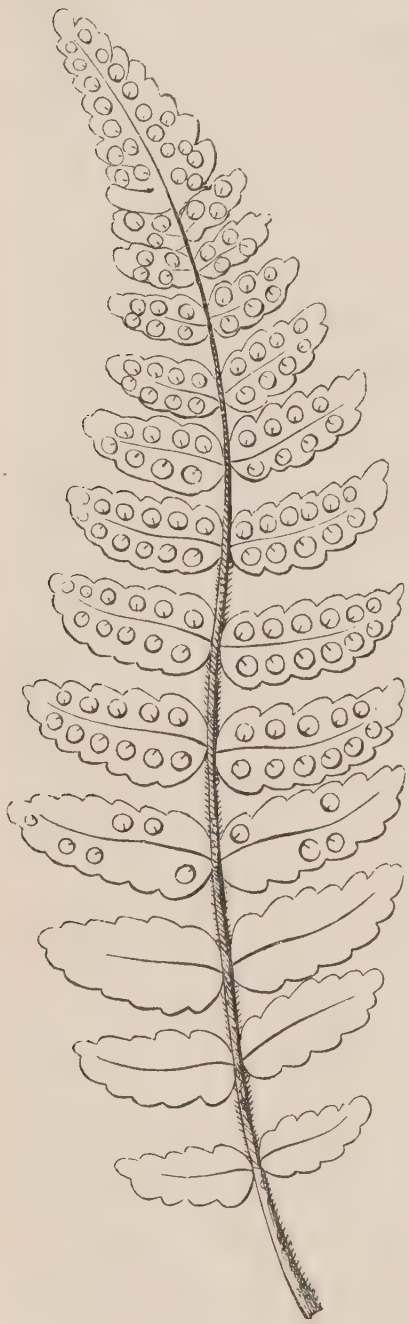
The fronds make their appearance in May: at first they are perfectly circinate, but after a few days the apex of each is liberated, and hangs down, the frond at this period possessing the bend which characterises a shepherd's crook, as represented at page 197. In this state it is very tender, and is generally cut down by the late frosts of spring; the loss is, however, quickly supplied; a second series of fronds make their appearance, and expanding at a more congenial time, arrive in safety at maturity. The fronds are mature in August, and last to the middle of winter quite uninjured: they are generally fertile, but plants are not of unfrequent occurrence which produce only barren fronds; and these are generally larger, greener, and have the pinnules more deeply serrated than when fertile. The fronds vary from five to ten or more in number; their position is nearly erect, or, perhaps, somewhat slanting, and radiating from a common centre. The length of the fronds averages between two and three feet, and the stem is naked nearly one-third of its length, and very chaffy.

The form of the frond is lanceolate and pinnate: the lower pinnæ are considerably shorter than those of the middle of the frond, but never approach the diminutive size of those of *L. Oreopteris:* all the pinnæ are nearly linear, but acute at the apex; they are regularly pinnate: the pinnules are obtuse, somewhat pinnate at the extremities, and serrated at their margins.

The lateral veins are forked half-way between the midvein and margin: after the fork the anterior branch bears a nearly circular cluster of capsules, which are covered by a smooth, lead-coloured, reniform involucre, which is attached to the back of the vein at the point where the stalks of the capsules are inserted: the involucre is more perfect, conspicuous and lasting, than in any other British fern: the lateral veins do not quite reach the margin of the pinnules, and the anterior branch of each is not quite so long as the posterior.

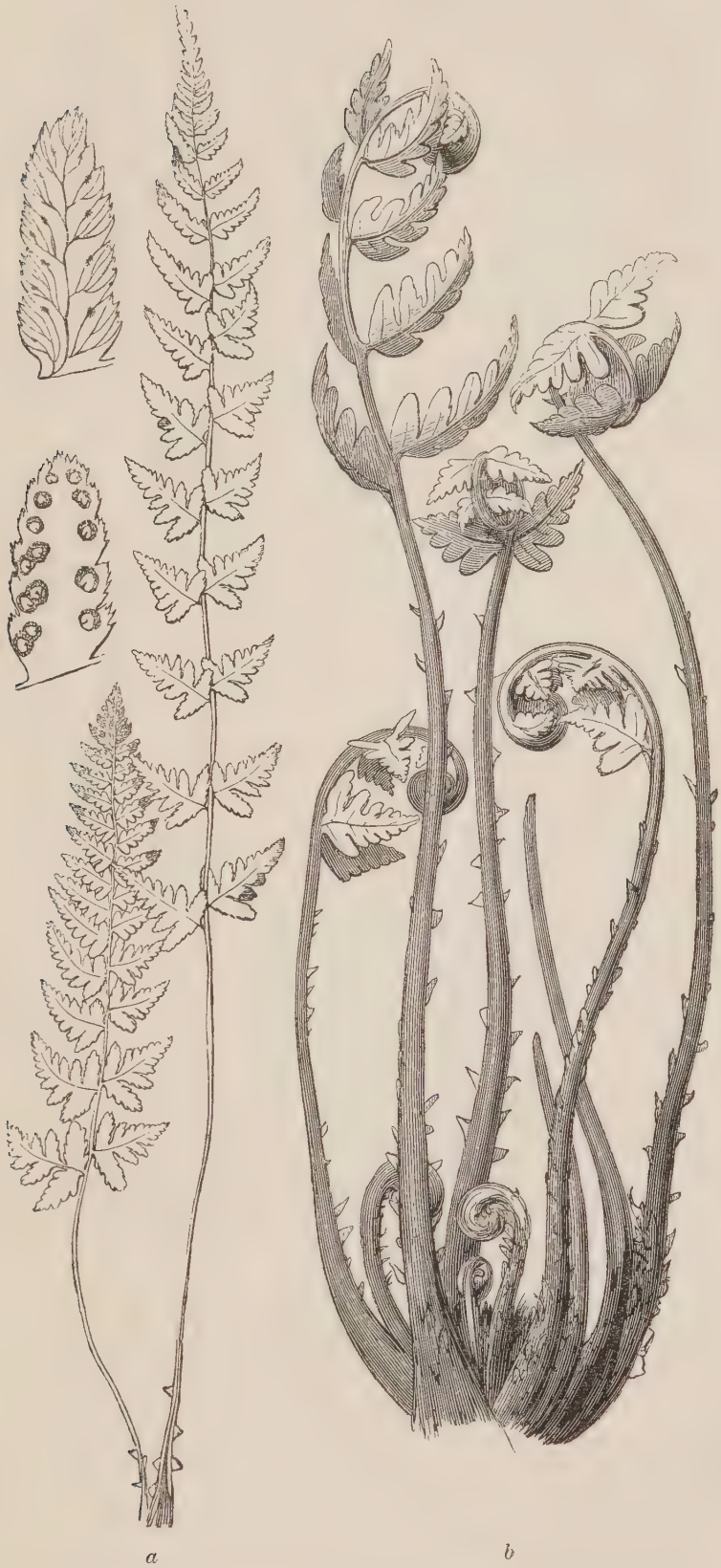
I am indebted to Miss Browne, of Tallantire Hall, near Cockermouth, for two remarkable forms of this plant which appear to be constant in that neighbourhood: these seem to vary in opposite ways; the first has the pinnules larger, broader and more crowded, than is usually the case; the second has them longer, narrower and more distant, as represented in the pinna, figure *b*, page 197: the first superior pinnule is generally much longer than the first inferior, a character also at variance with the usual structure of *Filix-mas.* This plant in habit and general appearance much more nearly resembles *Athyrium Filix-femina* than the species which I am now describing, but the scales of the stem, the texture of the frond, and the characters of the involucre (although I have only seen it after the bursting of the capsules), are decidedly those of *Filix-mas,* or a closely allied species. A third strange example of variation occurs in a specimen preserved in the herbarium of the late Mr. Winch, now in possession of the Linnean Society of London. This variety is precisely analogous to the lonchitiform specimens of *Polystichum aculeatum,* the pinnule being quite undivided: it does not appear to be a young or seedling plant, being as fully fruited,

in proportion to its size, as the fronds of larger growth : a figure of this remarkable specimen is introduced in the margin. A



fourth departure from the usual form occurs near Stormont house, Belfast, growing in company with great abundance of *Polystichum angulare*, the usual form of *Lastræa Filix-mas* and *Athyrium Filix-femina*. The points of discrepancy are these : frond narrow, elongate, pinnules very distant ; clusters of capsules small, separate and distinct : I am indebted to Mr. Moore for a specimen of this curious fern. A fifth form occurs on the limestone district of the north of England, in company with *Lastræa rigida :* I am indebted to Mr. Pinder for an example from Ingleborough : in this plant the great discrepancy exists in the smaller size, a foot being its extreme length, and in having its *large* clusters of capsules confined to the bases of the pinnules, where they form a crowded confluent line, which completely covers the midrib of the pinna. From a very careful comparison of this plant with the description of Decandolle's *Polystichum abbreviatum*,* I am induced to pronounce them identical, yet scarcely incline to consider the discrepancy from the usual form of *Filix-mas* sufficient for the establishment of a species. Mr. Borrer and Mr. Cameron have also noticed two forms of this fern, one of which is distinguished by the abundance of golden-coloured scales, which cover almost every part of the plant. The pinna *a* at page 197 is of the natural size and normal form.

* Flor. Franc. ii. 560.



EHRHART'S FERN (*a, one-eighth the natural size*).

LASTRÆA CRISTATA, Presl, Babington.
Aspidium cristatum, Smith, Hooker.

THIS is one of our most local ferns, occurring only on boggy heaths, and confined, as far as Great Britain is concerned, to four English counties.

CHESHIRE.—Mr. Pinder had the good fortune to discover this fern in Wybunbury bog, in this county, and has supplied me liberally with specimens.

NORFOLK.—The Rev. R. B. Francis was, I believe, the discoverer of this fern in Norfolk, in the year 1805; it was growing among furze-bushes by the side of a drain: it has since been found in abundance at Edgefield by Mr. Wigham, and on Bawsey heath, near Lynn, by Mr. Ewing, the Rev. Mr. Mumford, and Mr. Burlingham: it grows intermixed with the common ling, and is shaded by a few young alder trees. Mr. Burlingham, of Lynn, discovered a fourth Norfolk station in 1841; it is near the village of Dersingham, between seven and eight miles from Lynn, on the road to Hunstanton: in this station there are fewer roots, and it does not grow so luxuriantly as at Bawsey, probably owing to there being less moisture and no shade, as here it grows among ling unaccompanied by alders. I have to acknowledge my obligation to the Botanical Society of London, and to Mr. S. P. Woodward, for a fine series of specimens.

NOTTINGHAMSHIRE.—In this county it was first discovered by Dr. Howitt at Oxton bogs, and has since been found at the same locality by Mr. Riley, Mr. Quekett, Mr. Sidebotham, and several other botanists: Mr. Sidebotham has also observed it at Bulwell marshes. I am indebted to Mr. Riley and Mr. Kippist for specimens from this county.

SUFFOLK. — Sir J. E. Smith records that it was gathered by Mr. Davy on bogs amongst alder bushes, at Westleton, in this county.* I do not possess specimens.

Mr. Mackay gives this fern as a native of Ireland,† and Sir W. Hooker as a native of Scotland.‡ I have seen no specimens from either of these countries.

* Eng. Flor. iv. 300. † Flor. Hibern. 340. Hook. Flor. Scot. ii. 154.

This fern is of common occurrence on the continent of Europe, and throughout the United States of North America. I have received American specimens from Mr. Oakes, Mr. Lea, and Mr. Boott, the latter accompanied by living plants, which, have been growing for two years at Leominster, side by side with others from Lynn ; and although Mr. Lea, of Cincinnati, informs me that Dr. Torrey considers the American plant distinct, I must confess that the two appear to me to be identical.

This species is well figured in the 'Flora Londinensis.'* In Sowerby's 'English Botany' the name occurs twice: plate 1949 represents *Lastræa Filix-mas*, and plate 2125 appears to be intended for the present species, but is not characteristic. In describing *L. Filix-mas* Sir J. E. Smith remarks — "This species was certainly never mistaken for *A. cristatum* by the writer of 'English Botany,' p. 1949, but Mr. Sowerby was deceived by a wrong specimen sent him from the Isle of Wight, which he supposed of course to be correct, and from which he drew the figure. The blunder was set right in v. 30, p. 2125, of the same work."†

The name of *cristatum* was evidently intended by Linneus to comprise the present and the next species. Hudson, Berkenhout, Withering, and Bolton, adopt from Linneus the name of *Polypodium cristatum*, but apparently without any knowledge of the present species. Ehrhart was the first to describe the plant as a distinct and separate species, under the elegant name of *Callipteris*,‡ which has been adopted by Lamarck and Decandolle,§ perhaps the best nomenclaturists of the continent. It becomes a question concerning which much might be advanced on both sides, whether the name of Linneus or Ehrhart ought to stand : it appears to me to issue in the adoption of the Linnean name, since it happens that the author has selected a frond of this, the rarer species, as the authentic representative of his *Polypodium cristatum*. I am, however, compelled to relinquish the English name of "crested," as having been employed by Hudson, Withering, &c., to a different species ; indeed

* Flor. Lond. t. 113. † Eng. Flor. iv. 276. ‡ Ehr. Beitrage, iii. 77.
§ Flor. Franc. ii. 277.

so great is the confusion respecting "the crested fern" that I have determined to omit the name altogether.

The roots of *Lastræa cristata* are dark brown, numerous, and often matted together: the rhizoma is very stout, and gradually increases in length, as the plant increases in age, occasionally emitting a lateral branch, which in due time also becomes branched, so that an old plant is sometimes possessed of a very extensive and complicated rhizoma, which throws up fronds from all its extremities. The base of the stem of each frond, instead of decaying with the frond, retains its sap and vigour for many years, and in time assumes so nearly the appearance of the rhizoma that it is difficult to distinguish between the two. The figure in the margin, although perhaps not very ornamental, gives a correct idea of a longitudinal section of a portion of rhizoma. It is drawn of the natural size, and constitutes but a small portion of the plant from which it was taken: the median white space represents the rhizoma itself, and the shorter ascending white spaces on either side represent the still vigorous bases of old stems, with the exception of a small branch of rhizoma near the bottom of the figure on the right hand side. In the specimen I selected for illustration the interstices between the bases of the stems, represented by the darker portion of the figure, were filled with matted roots and turfy soil; on removing which I found every part of the surface of the rhizoma, and also the bases of the frond-stems, covered with

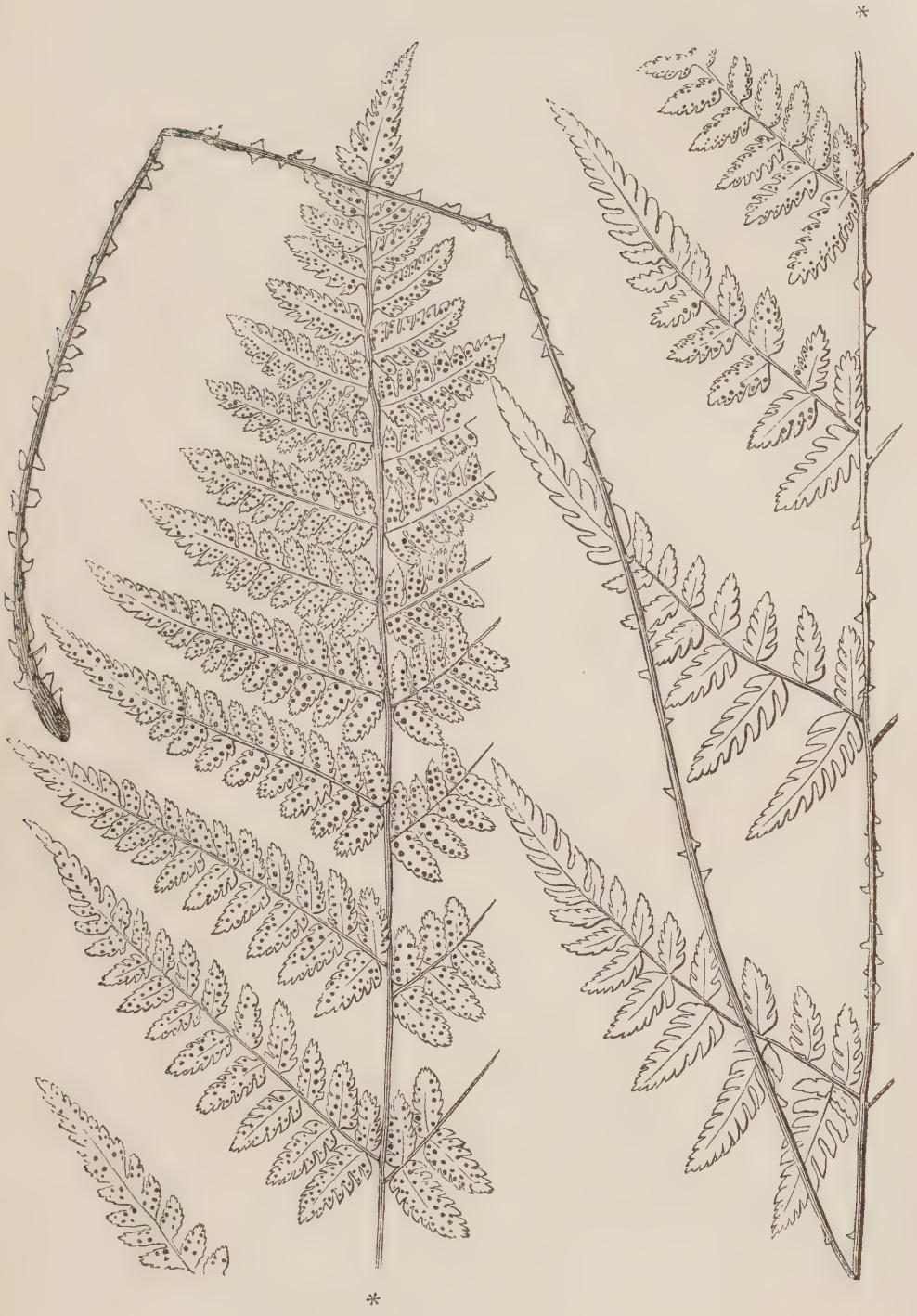
rudely semi-lunar markings, which seemed to indicate the former points of attachment for those chaffy scales with which the crown of the rhizoma, as well as stems of almost every species of *Lastræa*, appear to abound: a figure of the base of an old frond-stem exhibiting this character is given in the margin.

The fronds are but few in each tuft, and rise from the crown of each growing branch of the rhizoma; they appear in May, and remain green till near the end of the year. The form of the young unexpanded frond somewhat resembles that of *Lastræa Oreopteris;* the general character is circinate, but the pinnæ are perfectly flat, the lower pair being incumbent on the second, the second on the third, and so on. Young expanded fronds, of the natural size, are shown at *b*, p. 203; in every instance they were sketched from living and growing examples, a vigorous plant having been most obligingly sent me by Mr. R. Jacob. The stem is of nearly equal length with the frond, very erect, and clothed with scattered, broad, obtuse, short, semi-transparent, pale brown, uniformly coloured scales. The frond itself is erect, narrow, linear and pinnate: the pinnæ, which are attached by the stalk only, are generally rather distant, short, broad at the base, nearly triangular and pinnate, or deeply pinnatifid: the pinnules are very blunt at the apex, and serrated both at the apex and along the sides; they are generally decurrent or united at the base, and almost invariably attached to the midrib of the pinnæ by their greatest diameter. When the frond is very luxuriant and fruitful the pinnæ become much more elongate, and the pinnules more remote.

The lateral veins of the pinnules are many-branched, and the anterior branch bears a circular cluster of capsules about half-way between the midvein and margin: the clusters are covered by a flat, reniform involucre, the margins of which are sinuate, but not jagged or torn; and I have not been able to detect, either on its margin or disk, the slightest appearance of glands. In luxuriant specimens the clusters are much crowded, and finally become confluent; they are always confined to the upper part of the frond.

Observation on Lastræa dilatata or spinulosa.

In looking more carefully into those *similarities* which I supposed of sufficient importance to warrant the association of many forms under the specific name of *dilatata*, I find them invariably the concomitants of youth rather than the characteristics of perfection, and they become by degrees more and more obliterated, as the plants year by year advance towards maturity. The *differences*, on the other hand, so equivocally developed in seedling or starved individuals, become distinctly pronounced in the adult and vigorous; and a comparison of these, leaves me no choice but to cancel my former observations as erroneous, and to consider the names *dilatata* and *spinulosa* as having been applied to a family rather than to a species. Admitting this, it becomes a task of great delicacy to select an individual which shall bear alone all the honors of either patronymic. Fully appreciating the difficulty of the case, I have omitted both these names, and employed others which were originally, as now, restricted to *one* species.



WITHERING'S FERN (*one-eighth the natural size*).

LASTRÆA SPINOSA, Newman.

Lastræa dilatata, var. *linearis*, Babington.

This fern appears to be ubiquitous in the moist woods and marshes of England, as far as I have had an opportunity of visiting them. In Wales it does not occur so commonly, and I have not yet seen it in Scotland or Ireland. As this species is so little known, and so seldom recognized as distinct from the following, I cannot quote with confidence any information I have received from correspondents as to its distribution.

It certainly occurs in Germany, Sweden, and Hungary; but beyond these countries I am unable to trace its geographical range. I am indebted to Mr. Boott for two allied but apparently distinct species from the United States.

I am unacquainted with any figure of this fern.

The nomenclature of this species is involved in much obscurity. I hesitate to pronounce a positive opinion upon the subject; but, as already stated, I entertain no doubt that Linneus included it under his *Polypodium cristatum*, which he describes as growing "*sylvis sæpe uliginosis.*"* There is some difficulty in fixing an exact meaning to these words, but if we translate them literally, "frequently in marshy woods," we shall have a very correct definition of the usual locality of *L. spinosa;* but it also occurs frequently in marshes, and there mingling with *cristata*, so closely approaches it in appearance, that I have found the greatest difficulty in separating them. The Linnean *character* serves equally well for both species; and the *description*, confining the fructification to the upper fronds, throws no light whatever on the subject, that character being possessed by both species, and distinguishing them from the two next following. Under *L. cristata*, I have shown why I restrict the Linnean name to that species. It seems to me that Muller† had neither the merit of separating the two plants, nor any intention of giving a new name, but again describes them as one species, and merely adopts and *misprints* Weiss' prior name of *spinosa.*‡ As for his figure, cited by Withering, it represents but the apical portion of a frond, the decurrent and united pinnules of which resemble *L. cristata*, while the creeping rhizoma also

* Linn. Flor. Suec. p. 308 of 1st edition *only*. † Flora Danica, 707.

‡ P. Filix-femina γ. spinosa, Weiss. Crypt. p. 316.

more nearly resembles that than the present species; I cannot therefore consent to separate the *spinulosa* of Muller from the *cristata* of Linneus. Like Linneus, he probably included both the plants, but neither in his figure nor description do I find any reason for supposing he restricted his *spinulosa* to the present species.

Berkenhout* adopts the Linnean name, describing the habitat as "woods &c." and restricting the fruit to the superior pinnæ. He appears quite ignorant of the rarer species, and confines the name to the present only. Withering, on the contrary, adopts Muller's name, but also appears to restrict it to a single species. These authors' descriptions were published almost simultaneously, but Withering has the merit of distinguishing the following species from the present, an attempt in which every other British author has failed. It is, however, but an act of justice to four of our best botanists—Mr. Wilson of Warrington, Mr. Borrer of Henfield, Mr. Jenner of Lewes, and Mr. Forster of London—to say that they have always maintained that the two plants were distinct as species; and I am indebted to all these gentlemen for valuable communications on this interesting and intricate subject.

The confusion among continental authors is quite as great as in this country, and Roth is the only one, as far as my information extends, who has properly distinguished between them: his description I have quoted below;† and though I cannot but regret that his name of *spinosa* should so nearly resemble

* Berk. Syn. ii. 307.

† *Polystichum spinosum.* P. frondibus subtripinnatis: pinnulis oblongis pinnatifidis; laciniis pinnularum inferioribus inciso-serratis: serraturis spinulosis, stipite subpaleaceo. Perquam simile antecedenti (*P. multifloro*) et cautâ tantum inspectione rite distinguendum est. Differt tamen ab illo. 1. Fronde plerumque minore laxiore. 2. Stipite tenuiore, debiliore; paleis rarioribus adsperso, ad ramificationes non dilatato. 3. Pinnis remotioribus, per paria approximatis et suboppositis. 4. Pinnulis pinnatifidis, foliolis vel laciniis ala foliacea confluentibus; nec pinnatis. 5. Foliolis pinnularum inferiorum margine plerumque integris ad apicem dentibus spinulosis, conniventibus, tribus vel quatuor incisis; superiorum, excepto uno vel altero infimo, mucrone spinuloso, simplici, incurvo terminatis. 6. Capsularum glomerulis ad basin cujusvis folioli vel laciniæ solitariis paulo minoribus et ita in quavis pinnula biseriatis tantum.—Roth, Flor. Germ. iii. 91.

the one which I reject, yet I trust the difference will be sufficient to fix it in the memory, and I am inclined to believe Roth's is the original name, although perhaps first applied to the present plant, when it was supposed to be a mere variety of *Athyrium Filix-femina*.

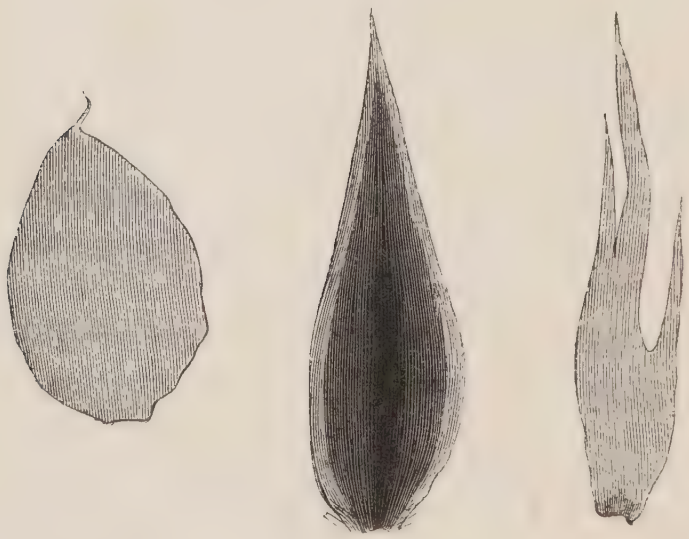
This fern is closely allied to the preceding, indeed, so much do they resemble each other, that I have found it next to impossible to fix on satisfactory diagnostics whereby to distinguish them. The roots are nearly black, numerous, and often matted together; the rhizoma is very stout, and gradually increases in length and becomes branched, as in *L. cristata*, but perhaps rarely to so great an extent, yet I have occasionally seen in woods, patches that occupied many square yards, and on digging amongst the fronds with a trowel, have found the tufts so much connected with each other, as to justify the supposition that the whole owed its existence to an original single rhizoma. The fronds, on rising from the ground in April and May, present a different appearance from those of *L. cristata*. The margins of the pinnæ are more convolute than in that species, and never possess the flattened formation which I have mentioned as characteristic of *L. cristata*. The stem is about equal in length to the frond, and nearly erect; it is clothed with blunt or rounded, semitransparent, uniformly coloured scales, so similar to those of the preceding species, that I cannot distinguish between them. One of these scales is represented by the left hand figure at p. 214. I consider this character alone quite sufficient to separate the species from either of those which follow. The frond is nearly erect; more so when growing on marshes and commons than when in woods: it is long, narrow — but not so narrow as the preceding, pinnate and linear, the pairs of pinnæ from the first to the eighth inclusive, being generally of uniform length; they are rather distant, and usually ascend at an acute angle from the main stem. The pinnæ are pinnate, and the pinnules detached and often distant; although connected by a slender wing, they have a deep notch on each side at the base, a character very rarely observable in *L. cristata*. On the first pair of pinnæ the first and second inferior pinnules are of nearly equal length, and are nearly twice as long as the corresponding supe-

rior ones: this discrepancy between superior and inferior pinnules gradually diminishes, and altogether ceases with the sixth pair, which are of equal length: a somewhat similar discrepancy is observable in the pinnules of the second pair of pinnæ, but beyond these it becomes scarcely observable: some of the lower pinnules are deeply pinnatifid, almost pinnate: the lobes of the pinnules are toothed, and the teeth terminate in short but distinct spines; each serrature with its accompanying spine has a decided curvature towards the apex of the pinnule. The entire frond is characterized by a flat surface, having neither the convexity which distinguishes the species immediately following, nor the concavity which is characteristic of the next but one.

The veins in the pinnules are alternately branched, each system of branches entering a division of the pinnule, and the anterior branch bearing a circular cluster of capsules just within the sinus which occurs between each two divisions: this cluster is covered by a flat reniform involucre, the margins of which are sinuate, generally entire, and always *without* stalked glands, a character which, as far as my observation has extended, is constant, and is of great importance in distinguishing this species from those which follow, (see the left-hand figure at page 236). This character sufficiently distinguishes the present plant from the *spinulosa* of Swartz, Willdenow, Schkuhr and Francis, all of which I imagine to be mere varieties of the next species. Owing to the constant position of these clusters on each pinnule they form a regular double line, the midvein of the pinnule passing up the centre: but when the pinnule is completely divided into lobes, each branch of the vein usually bears a cluster of capsules: this is more frequently the case in those pinnules which are nearest the main stem of the frond; and it may be observed that the clusters on all except the usual capsule-bearing branch are of smaller size. The seed, as pointed out by Linneus, Berkenhout and Withering, is confined to the upper portion of the frond: exceptions to this are of rare occurrence. The clusters are usually distinct and perfectly separate, indeed I may say always so when grown in woods, but on heaths they are more crowded, and I have seen specimens from Bawsey and Holt, in which they are quite confluent. Each branch of the vein enters

one of the serratures of the pinnule, but terminates before reaching the spine, with which it is quite unconnected.

It may be further observed, in comparison with the last species, that the pinnæ are pinnate rather than pinnatifid; the pinnules, though sometimes connected with each other by a slender wing, are united to the midrib of the pinna by a very small portion of their basal diameter; whereas in *cristata* the pinnules are generally decurrent, and united to the midrib by their entire basal diameter. The frond of *spinosa* is broader, its pinnæ longer, the sixth, seventh and ninth pairs not longer than the first and second; the pinnules sharper-pointed and more divided; the spines longer and more obvious: still, in the more important characters of the scales of the stem and the structure of the involucre, there is no perceptible difference; and the distinctness of the two, as species, is scarcely established by the trivial discrepancies which I have here noticed.



spinosa. multiflora. recurva.

ROTH'S FERN, (*one-sixteenth the natural size*).

Lastræa multiflora, Newman.

Aspidium dilatatum, spinulosum and *dumetorum*, Smith.

Aspidium spinulosum, Hooker.

I believe this fern to be universally distributed throughout the British Islands: it grows luxuriantly in moist woods, delighting in vegetable mould, and attains a great size on warm, sheltered hedge-banks, particularly if accompanied by a ditch. I refrain from stating that under an altered and diminished form it ascends our highest mountains, since I consider it possible, that what is supposed a mountain form of the present plant, may eventually prove specifically distinct.

This fern is so imperfectly known that I am unable to give its European range, but I believe it to be common on the continent. I have received no corresponding form from my friends in the United States.

There is no figure to which I can with confidence refer as representing this species.

It may appear somewhat strange that I should be unable to find more than one intelligible description of this common plant, yet such is the case; and I adopt Roth's name of *multiflora*, not because it has the claim of priority, which is however probably the case, but because I cannot make it out to be either the original *Polypodium spinulosum*, as supposed by Willdenow,* Hooker,† and many other authors; the *Polypodium dilatatum* of Hoffmann, as supposed by Smith,‡ Wahlenberg,§ and many others; or the *Polypodium cristatum* of Linneus, as supposed by Bolton,‖ Withering,¶ &c.: nor do I believe that sufficient information will ever be gleaned from either Muller's or Hoffmann's description, to settle the point satisfactorily in favour of either, and the Linnean name of *cristatum*, for reasons already given, I have assigned to a very different species. Roth's description, as cited below,** is too clear and

* Sp. Plant. v. 262. † Brit. Flor. 440. ‡ Eng. Flor. iv. 280.
§ Wahl. Fl. Lap. 232. ‖ Bolt. Fil. 42. ¶ Arr. Brit. Pl. iii. 778.

** *Polystichum multiflorum.* P. frondibus supradecompositis; foliolis ovato oblongis, inciso-serratis; serraturis spinulosis, stipite paleaceo. Frondes bipe-

explicit to allow of our doubting for a moment that it belongs to the present plant; and I must observe, for the information of those who wish to go more fully into the question of date, that although this volume of the 'Flora Germanica' was published in 1800, the description of *multiflora* had previously appeared in the 'Catalecta Botanica,'* and that the author claims for it priority over Hoffmann's name of *dilatatum*, which he supposes may be intended for the same species. Be this as it may, I hope I shall find botanists willing to do honor to Roth's admirable description by adopting his name, for of a truth we may exclaim with him,—"*Maximæ sanè et fere insuperabiles in determina-*

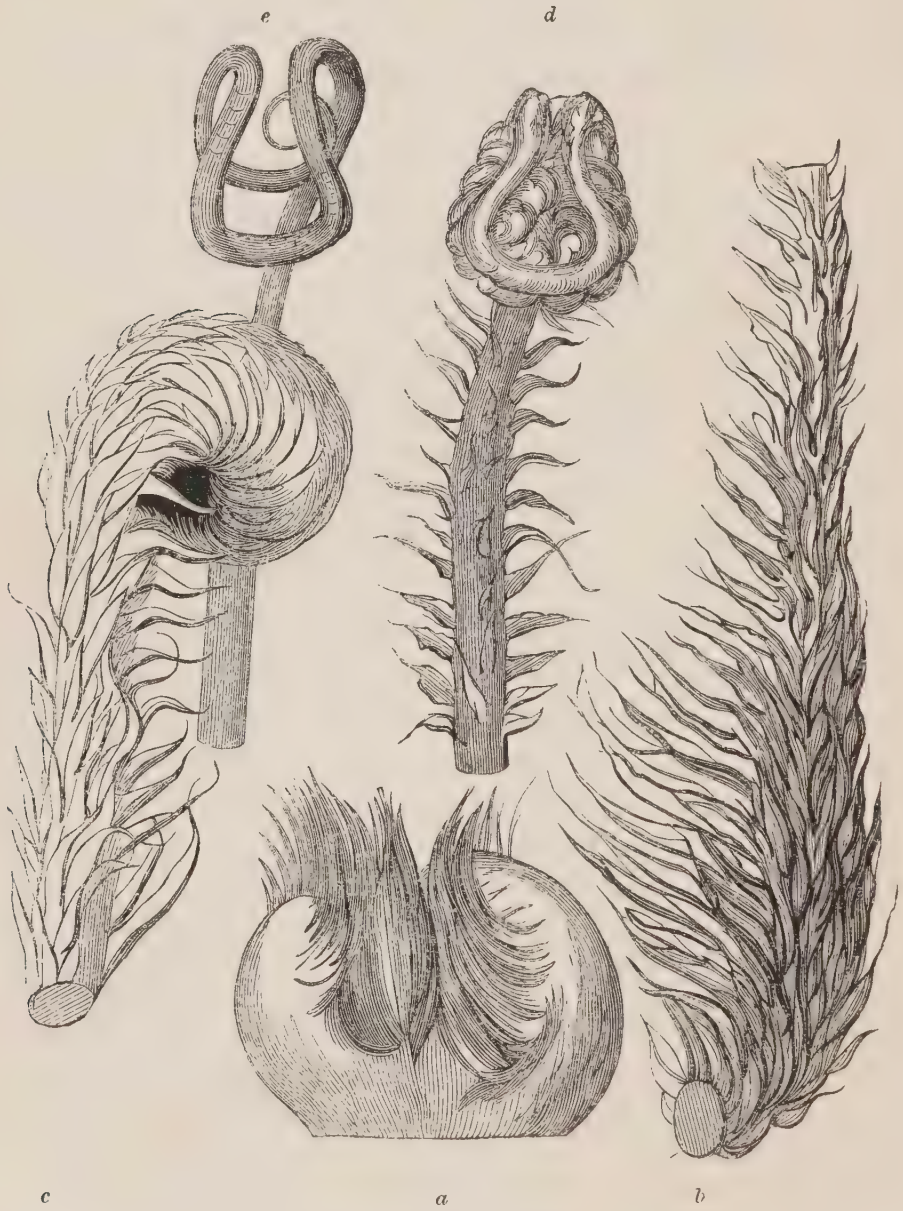
---

dales et longiores, infra medium semipedem et ultra latæ, saturate virides, subtus pallidiores, rigidæ, ovato-oblongæ, apice acuminatæ, plane tripinnatæ: pinnis alternis patentibus in apicem pinnatifidum decrescentibus; inferioribus duplo fere brevioribus et latioribus mediis, plerumque sterilibus, basi hinc productioribus, oblique triangulis, bipinnatis: mediis reliquis longioribus, oblongo lanceolatis, fere bipinnatis; superioribus lanceolatis, magnitudine decrescentibus, pinnatifidis demum in mucronem tenuem pinnatifidum desinentibus. Pinnulæ alternæ, patentes, oblongæ, acutæ, glabræ; infimæ pinnarum inferiorum iterum pinnatæ, quarum exteriores magis protensæ, interioribus socialibus, sesquiuncinales et longiores; superiores pinnatifidæ, tamen ad nervum fere divisæ et ala foliacea tantum confluentes, angustiores, demum in mucronem acutum, tenuem, acute serratum confluentes; foliolis vel laciniis suboppositis, oblongis, obtusiusculis, patentibus, margine inciso-serratis, apice plerumque trifidis; serraturis spinula incurva terminatis, conniventibus. Stipes e viride fuscescens, rigidus, infra medium nudus, paleis fuscis validis secundum totam longitudinem adspersus, ad pinnarum exortum parum dilatatus et quasi nodosus, tamen minus flexuosus, hinc convexus, inde canaliculatus. Fructificationum puncta subrotunda, crassiuscula subtus in foliolis vel laciniis pinnularum duplici serie disposita, paribus in quovis foliolo vel lacinia duobus vel tribus in majoribus pinnulis raro quatuor, hinc in pinnula subtus secundum longitudinem considerata quadruplici plerumque serie collocata apparent, in inferioribus pinnis, rariora et remotiora, in summis duplici tantum serie secundum longitudinem, intra pinnulæ costam et laciniis distributa, primum distincta, demum fere confluentia, fusco-ferruginea, tecta involucro reniformi-subrotundo, protuberantibus capsulis margine undique libero, demum ad punctum suum fixum laterale retracto, capsulis tunc effusis. Capsulæ subrotundæ, fuscæ, pedunculo longo, tenui, pellucido insidentes annulo articulato atropurpureo cinctæ. Semina plurima exigua fusca.—Roth, Flor. Germ. iii. 87.

* Roth, Cat. Bot. i. 135.

tione hujus filicis difficultates." A volume might be filled in an attempt to unravel its synonymy, and it seems most advisable to adopt without discussion the only name accompanied by a description that is really intelligible.

The roots are numerous, black, wiry and very tenacious, the rhizoma large and tufted; I have never found it elongated and branched, as in *L. cristata* and *L. spinosa*. The crown of the rhizoma is densely clothed with large long brown scales.



The fronds rise early in May, and continue coming up until Midsummer: they are characterized by a peculiarity in verna-

tion which I have not hitherto seen noticed; the main stem of the frond, instead of being regularly circinate, or composed of diminishing rings, like those of an Ionic volute, is doubled near the insertion of the second pair of pinnæ, and turns back, forming a kind of loop. I have endeavoured to exemplify this in the accompanying figures, which are of the natural size. *a* shows the crown of the rhizoma before the fronds have begun to grow; *b* is the basal portion of the stem of a young frond, *c*, its apex; *d* shows the peculiar bend of the frond above described, and *e* the stem of the same frond in the same position, but stripped of its pinnæ and scales. In favorable situations the fronds of mature plants, including the stem, measure five feet in length: this magnitude is, I believe, unequalled by any of our British ferns, except the common Brakes and *Osmunda regalis*. I select for description a specimen for which I am indebted to Mr. John Ray of Epping, and first give its dimensions. Total length from the rhizoma to the apex of frond, sixty inches: from rhizoma to the insertion of the first pair of pinnæ, twenty-four inches: from the insertion of the first pair of pinnæ to the apex of frond, thirty-six inches. It must, however, be borne in mind that the relative length of the stem and frond is subject to great variation, being influenced by situation, degree of moisture, nature of soil, quantity of shade, and a number of other casualties. The length of the first pair of pinnæ, seven and three quarter inches; second pair, eight and a half inches; third, eight and three quarters; fourth, nine inches; sixth, eight and three quarters; seventh, eight; eighth, seven; ninth, six; tenth, four and three quarters; eleventh, four; twelfth, three; thirteenth, two and a half; fourteenth, two: the remainder rapidly decrease in length, until the frond terminates in an acute point. The lengths of stem between the pairs of pinnæ are these:—in the first instance four and a half inches; in the second, three and a half; in the third, three and a quarter; in the fourth, three; in the fifth, two and a half; in the sixth, two and a quarter; in the seventh, two; in the eighth, one and three quarters; in the ninth, one and a half; in the tenth, one and a quarter; in the eleventh, one; in the twelfth, three quarters; in the thirteenth, half an inch. From these admeasurements it will appear that the figure

of the frond may be described as oblong-lanceolate, and cannot, in any acceptation of the term, be characterized as deltoid or triangular, words which are almost invariably employed in the description of what is named *Aspidium dilatatum*. And I may remark, that although I have examined some hundreds of mature fronds, I have never seen one more nearly triangular than that of which I have given the measurements: that triangular fronds do frequently occur, I will not dispute; but these are from seedling or starved plants, or are without fruit, of diminutive size, or from some cause or other have not attained their normal form. The stem is very stout at the base, and thickly clothed with long, pointed scales, which are of a very dark brown colour along the middle, pale brown and nearly transparent at the sides: it is very possible that several species possess these scales, indeed, I am quite disposed to believe this is the case; but the character is amply sufficient to distinguish this species from the preceding and following, which are generally confounded with it. One of these scales is represented by the middle figure at page 214. The frond is pinnate, the pinnæ are nearly opposite, and as we have seen by the admeasurements, the pairs gradually approximate from the base towards the apex; the first and second pairs are very broad at the base, in some instances nearly triangular: the third is longer and narrower; the fourth, fifth, and sixth still longer and narrower, and also more linear, the sides being nearly parallel: all the pinnæ are pinnate, except those quite at the apex of the frond: the pinnules are distinctly separate and almost stalked; those of the upper pinnæ are connected by an extremely slender wing of the midrib of the pinna, but this wing is not to be distinguished on the lower pinnæ, except near the point: those on the lower pinnæ are pinnate, on the middle pinnatifid, and on the upper deeply lobed: all the divisions are serrated, and each terminates in a short but distinct spine. In the first, second and third pairs of pinnæ the inferior pinnules are much longer than the superior; the first inferior pinnule of the first pair of pinnæ is sometimes longer sometimes shorter than the second, but the first, second and third are almost invariably much longer and altogether larger than those

which succeed them; the diminution of the rest in size is sometimes very abrupt, sometimes gradual.

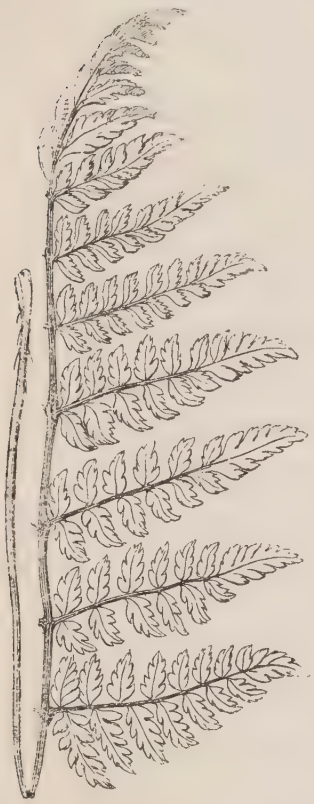
Each lateral vein supplies one lobe or division of a pinnule; it is always branched, and almost every branch bears a circular cluster of capsules: the clusters therefore are much more numerous, scattered and irregular than in the preceding, and want that formal biserial appearance which distinguishes that species. They are covered by a very irregular but somewhat reniform involucre, whose margins are uneven, and more or less fringed with sessile or stalked transparent glandular bodies; these are described as characteristic of *Aspidium spinulosum* by Swartz, Schkuhr, Willdenow, Sadler and Francis, and the present plant is thus identified with the *spinulosum* of those authors. This involucre is represented by the middle figure at page 236.

Contrasted with the preceding, *Lastræa multiflora* is a much larger plant; its fronds are much longer, broader, heavier, and of a deeper green colour; their position curved or arched, often pendulous, never erect, and every part of the frond, instead of being flat, has a tendency to be convex. When the fronds are young, every part of their under surface, more particularly the ribs, abounds with minute stalked glands, imparting a mealiness of appearance to the plant, which distinguishes it from *L. spinosa*, as the same character separates *P. Dryopteris* and *P. calcareum:* again, in *L. multiflora*, every part of the frond is covered with capsules, except about the base of the first pair of pinnæ, in which they are sometimes wanting; in *L. spinosa* they are usually confined to the upper part of the frond. The divisions of the frond are much more numerous, and the number of clusters proportionably greater, but the large, long and pointed scales on the stem, with their dark middles and pale sides, will furnish botanists with the best and most constant character, since in the seedlings of the two species all characters of figure, cutting, size or fructification, are apt to be wanting.

There are two forms, so different in many respects from the normal form of *L. multiflora*, that I feel great difficulty in giving any opinion as to whether they are distinct species, or merely modifications of the one which I have now been describing. I do not however feel justified in making any further addition to

our list of species at present, and therefore merely enumerate them as varieties.

Lastræa multiflora, var. *nana*.



This plant, of which a figure is given in the margin rather less than the natural size, is dwarf, rigid and convex in every part, and usually of a very dark green colour, sometimes inclining to brown. The clusters of capsules are large, very distant, and conceal rather than are covered by a small shapeless involucre, on which I have never discovered the glands observable in the normal form of the plant. It is of frequent occurrence in the boggy and hill districts of Scotland and Ireland, and I have seen it, although more sparingly, on the mountains of Wales. Its character did not appear changed by cultivation for two years at Leominster; yet I feel by no means satisfied that it is more than a starved state of the common plant, and if so, should not be admitted as a variety.

Lastræa multiflora, var. *collina*.

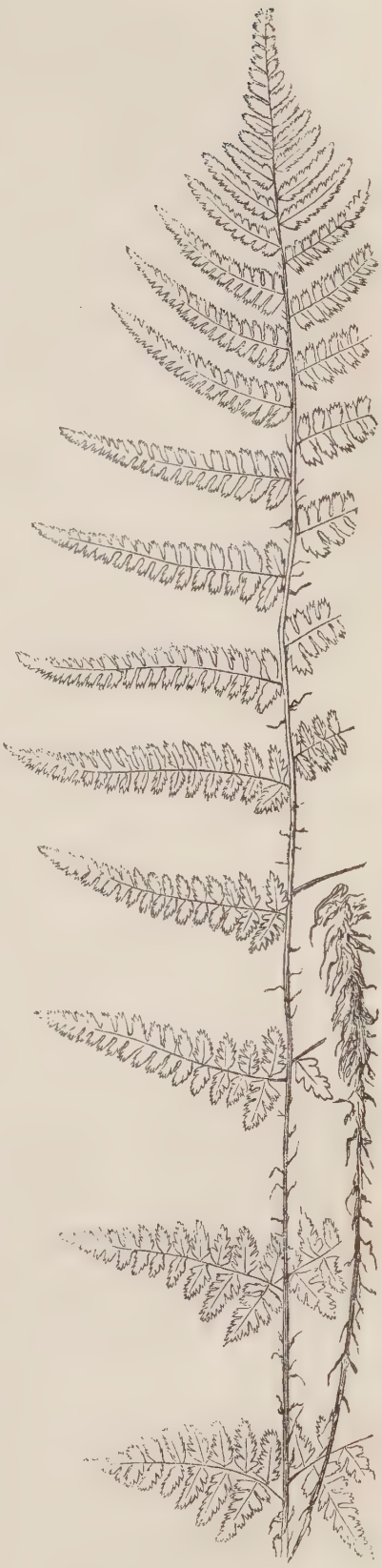
I venture on giving this fern a distinguishing epithet, because neither of the descriptions of *Polypodium tanacetifolium*, to which species I incline to refer it, is sufficiently definite to warrant my giving it that name. The *P. tanacetifolium* is a species which appears to be almost unknown to living botanists. It was first described in 1795, by Hoffmann; and as it may possibly turn out to be one of my three forms of *Lastræa multiflora*, I shall quote the original description in a foot-note.* Roth† sup-

* *P. tanacetifolium*, fronde bipinnata, stipite et pinnis basi æqualibus, pinnatifidis: pinnulis linearibus inciso-serratis mucronatis; fructificationibus sparsis in angulorum serraturis. In sylvaticis montosis hinc inde Maj. Oct. Involucrum subreniforme.—Hoffmann, Deutschlands Flora, ii. 8.

† Variat pinnulis pinnarum infimis profunde inciso-serratis, reliquis omnibus simpliciter serrato-spinulosis. Huc forsitan spectat *Polypodium tanacetifolium*. [Here follows Hoffmann's description already quoted]. Sane huic varietati proximum est, et vix species differe videtur.—Roth, Flor. Germ. iii. 92.

poses it to be merely a variety of his *Polystichum spinosum*, but Lamarck and Decandolle admit it as a species without any hesitation, and say that it has been found by Desfontaines on the mountains of Auvergne.* The only specimens I have seen of the British plant, are two small ones in the Smithian herbarium (which are labelled as having been raised by Mr. Shepherd from the seeds of Smith's *Aspidium dumetorum*), and a few fronds collected upon the hills of Westmoreland, Yorkshire and Lancashire: and I am indebted to the kindness of Miss Beever and Mr. Pinder for those which I possess from these localities. We must not, however, conclude that the species is rare, on account of its absence from herbaria, since everything supposed to be referrible to *dilatata*, is but too commonly rejected by the collector.

Little as we learn from the Latin and French descriptions which I have



collina.

* *Polystichum tanacetifolium.* Sa feuille est grande, elegante, presque trois fois pennée; le pétiole commun est droit, cylindrique, chargé de quelques écailles roussâtres, non renflé à la division des pinnules; celles-ci sont elles-mêmes pennées, et leurs folioles sont profondément pinnatifides; les lobes sont linéaires, dentelés vers le sommet; les fructifications sont placées à l'aisselle des sinus des lobes; le tégument est peu apparent, en forme de rein ombiliqué sur le côté. 2/. Cette espèce a été trouvée dans les montagnes d' Auvergne, par le C. Desfontaines.—Flor. Franc. ii. 562.

quoted, I fear that I shall be able to add scarcely anything more satisfactory. With regard to the outline of the frond, my specimens are so various as to offer among themselves as great a contrast as we find between any two species of the genus: the extremes of form appear to be the regular deltoid and the narrow elongate-lanceolate, more gradually attenuated towards either end than the normal form of *L. multiflora*. I take the deltoid for the younger, and the lanceolate for the older plant: a root found by Mr. Pinder near Chapel Styles in Westmoreland, bearing fronds of an intermediate form, produced in cultivation completely lanceolate fronds. I therefore introduce a short description of the lanceolate, supposing it the mature form. Stem half as long as the frond, which is elongate-lanceolate and pinnate, the pinnæ are very distinct, and set on at nearly right angles with the main stem; the first pair are obtusely deltoid, the second elongate-deltoid, and the remainder nearly linear with acuminate apices; all are pinnate, the pinnæ ovate obtuse, slightly auricled and regularly toothed; their attachment to the mid-stem of the pinnæ resembles that in *L. spinosa;* there is less appearance of a stalk than in *L. multiflora*, and the spines of the serratures are far less distinct than in either of these species. All the pinnæ bear seed, but the lower pair less abundantly; the clusters are proportionately larger than in *L. multiflora:* they are crowded and become confluent, completely hiding the mid-rib of the pinnules. The stem is pale green, with dark brown scales, much resembling in form and colour those of *L. multiflora*, the involucre also, as far as I can learn from my specimens, exhibits no discrepancies. Should this fern prove distinct as a species, which I anticipate will be the case when we have more copious materials for forming an opinion, I beg to propose that it be called *Lastræa collina*, and that it bear the English name of "Pinder's Fern," in compliment to the gentleman who first called my attention to its remarkable difference from the usual form of *L. multiflora;* provided always that it proves to be undescribed.

I am indebted to Mr. Pinder for a fourth very beautiful variety, which occurs at Madeley, Staffordshire; but as this seems confined to a few examples, I forbear further notice of it.

BREE'S FERN, (*one-fourth the natural size*).

Lastræa recurva, Newman.

This beautiful fern grows amidst grass in exposed and rocky situations, and also abounds in warm and sheltered woods, especially in the vicinity of water-courses; the latter appears its natural habitat, since in the former situation it is dwarf, less copiously fruited, and appears altogether less healthy and vigorous. I am compelled to neglect many communications which possibly refer to this species, because I find the plant so imperfectly known. In every locality mentioned, I have either seen the plant growing, or possess specimens. It must by no means be presumed that I suppose the English range confined to the three counties I have mentioned, but these are the only English habitats for the accuracy of which I am enabled to vouch from actual observation.

Cornwall.—I am indebted to the Rev. W. T. Bree and to Mr. Alfred Greenwood, for specimens from the vicinity of Penzance.

Cumberland.—I am indebted to Mr. Pinder for specimens gathered near St. Bee's head, in this county.

Sussex.—I am indebted to Mr. Bree for a specimen procured by Mr. Dickson from this county; and to Mr. E. Jenner of Lewes for several others, gathered at Eridge rocks, Tunbridge Wells. Mr. Jenner had also the kindness to conduct me to the spot where it abounds, and thus afforded me the pleasure of examining the plant in every stage, while yet growing: I found that every character seemed to justify the opinion I had formed in Ireland four years previously, of its being perfectly distinct from *multiflora*. Mr. Luxford has found the same plant upon the moist, wooded slope opposite the rocks at West Hoathly.

I have not observed this fern in Wales, neither have I received a single specimen from any part of the principality.

From Scotland I have seen no specimen, neither have I observed it in my walks in that country.

In Ireland it is very abundant, and indeed is quite one of the commoner ferns.

Antrim.—I first saw this beautiful fern growing luxuriantly below the basaltic cliffs at Fair head.

Clare.—Near Loop-head.

Cork.—I found it in profusion in the woods about Glengarriff, and am indebted to Mr. Woodward for a specimen gathered in the vicinity of Cork.

Donegal.—Several places on the banks of Lough Swilly, Milroy bay, Arrigal hill, near Donegal, and about Lough Derg.

Galway.—About Clifden, about Roundstone and Ballinahinch, and near Oughterard.

Kerry.—On all the mountains and in all the woods: in the neighbourhood of Killarney it is so conspicuous an object as to have excited the admiration of many botanists. Mr. Ogilby, of Dublin, writes thus:—"This is, in my opinion, the most beautiful of our robust ferns: in style of growth and elegance of form it is most striking; it presents two tiers of fronds, if I may so describe them, the lower more pendulous, the upper more erect, and it is on the more erect fronds that the fructification is most perfectly developed: the dark purple stem contrasting with the light green and crisped appearance of the pinnæ give a peculiarly elegant feature to the plant: it likes the seclusion of trees, and places where it is not pressed by other vegetation; on spots about Dinis Island, and more particularly under Cromaglaun mountain, it may be seen fully developing all its loveliness." At O'Sullivan's cascade, in the same neighbourhood, I observed it in the most graceful and beautiful luxuriance; it forms a chief ornament of that exquisite little waterfall. I am indebted to Mr. Ogilby and Mr. S. P. Woodward for specimens from the vicinity of Killarney, and to Dr. Taylor, of Dunkerron castle, for others from the neighbourhood of Kenmare.

Londonderry.—Near Coleraine, near Rushbrook, in several localities near Garvagh, and near Londonderry.

Mayo.—Foot of Nephin, Coraan Achill, Newport, Westport &c.

Sligo.—Among limestone rocks on the approach to Sligo from Manorhamilton.

Wicklow.—Most abundant, beautiful and luxuriant at Glendalough: it here occurs of every possible gradation of size, on the exposed and bare rocks it is very diminutive, but in the woods it attains a large size, and is equally beautiful with the specimens growing in the woods about Killarney.

I should add that Mr. Borrer and Mr. Jenner, both of whom

are well acquainted with this species, and consider it perfectly distinct, have given me other habitats in Herefordshire, Merionethshire and Sussex.

Beyond the limits of our own country I am unable to trace the range of *Lastræa recurva.*

I am not aware of the existence of any figure of this fern, excepting those which are presented to the reader in the present volume: for that given below I am indebted to the kindness of the late lamented Mr. Loudon; to whose readiness to oblige, and to render assistance on all subjects connected with Natural History, I am glad to have an opportunity of bearing my humble and grateful testimony.

The following notices respecting this fern have occurred.

The Rev. W. T. Bree, in a paper on Cornish plants written for the fourth volume of Loudon's 'Magazine of Natural History,' mentions *Aspid. dilatatum* var. *recurvum* for the first time under that name, and in a foot-note gives the following description.

"This fern I have very little doubt is really a distinct species; and one which I believe has not hitherto been described, at least not as a native of Britain. Although it strikes the eye immediately as being different from *Aspidium dilatatum*, it is difficult, I confess, to seize upon those permanent characters by which it is to be distinguished. The minute divisions of the leaflets in *Aspidium dilatatum* frequently droop or curl under, while the corresponding parts in the present subject invariably curl back or upwards in an exactly contrary direction [see fig. *b*], and thus give the whole frond a singularly crisped appearance. But the strongest character by which it may be distinguished from its near ally, consists in the lowest pair of pinnæ or leaflets being much larger than the others, which is not the case in *A. dilatatum;* so that the frond assumes a deltoid or triangular form, broadest at the base, and tapering to the apex.

The fern occurs plentifully in the neighbourhood of Penzance, growing in situations similar to those in which *A. dilatatum* is found. I have also met with it in several parts of Ireland, particularly near Killarney, and have received plants of it from the celebrated cryptogamist, the late Mr. James Dickson, who procured it from Sussex, and considered it as a distinct species. Like *A. dilatatum*, it is a very variable species, the plant differing greatly in size according to the situation in which it grows: on very dry banks I have found perfect fructifying fronds not more than a few inches high." *

Sir W. Hooker, in the fourth edition of the 'British Flora,' refers to this observation of Mr. Bree's, but does not retain the plant even as a variety.†

In a paper on the Botany of Erris, published in the 'Magazine of Zoology and Botany,'‡ Mr. Babington notices the occurrence of our fern in that district, and refers to Sir W. J. Hooker's, but not Mr. Bree's notice of the plant. The next notice occurs in a communication of my own to the 'Magazine of Natural History,' which is in these words: —

"The third form [of *dilatatum*] is short, less rigid and erect, bright pale green and concave, not simply as a frond, but every pinna and pinnule also concave; this I believe to be the *Aspidium dumetorum* of Mackay,§ the *Asp. dilatatum* var. *concavum* of Babington, and the *Asp. spinulosum* of the Botanic Garden at Belfast, &c. This form is far more distinct and constant than any variety we possess in England."‖

Subsequently to the publication of this passage, I received the following note from Mr. Moore of Dublin. "On my way hither I called at the Liverpool Botanic Garden, where Mr. Shepherd showed me the *identical plant* which Sir James Smith described his *Aspidium dumetorum* from, and I can without the least hesitation pronounce it to be the *Aspidium concavum* of Babington, which fact I thought might be interesting to you. I consider Babington's name a good one, and likely to assist much

* Mag. Nat. Hist. iv. 162. † Brit. Flor. 386, ed. 4.

‡ Mag. Zool. and Bot. ii. 119.

§ Flor. Hibern. 341. Mr. Mackay has since assured me I am correct in this.

‖ Mag. Nat. Hist. n. s. iii. 551.

in determining the variety, as I have never seen it without the pinnules being more or less concave."

In consequence of this information I altered the passage when I reprinted my 'Notes on Irish Natural History,' as follows:— "The third [form of *dilatatum*] is the *Aspidium dumetorum* of Smith and Mackay, the *Asp. dilatatum* var. *concavum* of Babington, the *Asp. dilatatum recurvum* of Bree, and the *Asp. spinulosum* of the Botanic Garden at Belfast, &c. This form is far more distinct and constant than any other with which I am acquainted." *

These views were repeated in the first edition of the 'History of British Ferns.'

The Rev. W. T. Bree, in a late communication to 'The Phytologist,' claims for this fern the rank of a species. I shall quote the entire passage.

"The announcement of a new edition of your 'British Ferns' induces me to trouble you with a remark, for which you may perhaps find room in 'The Phytologist.' In the 4th vol. of the 'Magazine of Natural History,' under the head of 'List of Rare Plants found in the neighbourhood of Penzance' (p. 162), I mentioned, among other things, *Aspidium dilatatum*, var. *recurvum*, not knowing how else to designate what I believed to be an undescribed British fern; and in a note at the foot of the page I expressed an opinion to that effect. Since the publication of that list, the fern has been noticed by several botanists, and recorded by yourself as a variety of *dilatatum*. I am perfectly aware that *dilatatum* is a most variable species, assuming as it does very different appearances according to soil, situation, shade, moisture, &c. *Recurvum* is equally given (if I may so say) to "ring the changes" on variety, but to a practised eye it is, in all its forms, readily distinguishable from every form of *dilatatum*. And I now beg to say, that after close observation of the fern in the neighbourhood of Penzance, in the year 1817, and on the Irish mountains some years previously, as well as from an intimate acquaintance with the plant in a cultivated state from that time to the present, I am confirmed in my

* Notes on Irish Natural History, 4.

opinion, that the fern in question is a species distinct from *dilatatum;* and as such I hope to see it noticed in your forthcoming new edition of 'British Ferns.'"*

In the 'Naturalists' Almanack' for 1844, the species first received the name of *Lastræa recurva.*†

The history of the fern is thus brought down to the present period; and it seems needful to show why, after receiving such excellent evidence on the subject as I have quoted from the pen of Mr. Moore, and even adopting Mr. Moore's view, as I subsequently did, I should reject the name of *dumetorum,* which has so clearly the claim of priority. My reasons for preferring Mr. Bree's name are these. Mr. Bree's figure and descriptions most evidently refer to the plant now under consideration, and the original specimens which he has most kindly transmitted to me, are beyond all question identical with my own. On the contrary, Sir James Smith's description, which I now proceed to quote, *does not allude to any one of the distinguishing characters of the species.*

"Frond doubly pinnate; leaflets pinnatifid, lobes with terminal, sharp, prickly teeth. Common stalk scaly. Cover orbicular, flat, with a deep notch. * * About one third the size of the last [*A. dilatatum*], with which it agrees in general habit and structure, but the leaflets are rather more ovate, and their segments more closely crowded together, less serrated at the sides, but their bristly teeth more numerous at the extremity of each segment. Masses few, small and rather scattered. Cover thin, pale, flat, not tumid nor kidney-shaped, but more orbicular, with a deep notch at the lower part, and finally turned loosely aside by the few rather large, shining, brown capsules, whose rings are very apparent. Sometimes the masses are placed at the very edges or points of the segments, and the covers are often torn, but they are never tumid like a kidney, nor fixed closely by their outer margin, as those of *A. dilatatum* are. I think these two species may always be distinguished by the situation of their fructification and the nature of their covers."‡

The author refers to the *Polypodium rhæticum* of the Bank-

* Phytologist, 773. † Nat. Alm. 1844, p. 23. ‡ Eng. Flor. iv. 282.

sian herbarium, as identical with his *Asp. dumetorum:* after a careful examination of the herbarium, with the assistance of Mr. Bennett, I cannot find a specimen of the present plant; and in Smith's own herbarium, at the house of the Linnean Society, the species is represented by two seedling and evidently diseased fronds of *Lastræa multiflora*, so that we really have no evidence beyond the Liverpool specimens, to which I must again recur, that the *Aspidium dumetorum* of Smith and the *Aspidium recurvum* of Bree are synonymous: and therefore I have no choice but to follow the author whose description I understand, and with whose plant I am well acquainted.

A paragraph from the pen of the late lamented Mr. D. Don, to whom I am under so many obligations for information on every branch of my subject, will, I think, prove the correctness of my statement as to Sir J. E. Smith's authentic specimens: it is published in the 'Transactions of the Linnean Society of London,' and is quoted verbatim below.

"This [*Aspidium dumetorum*] is made up of two plants, the one, from Cromford moor, being a dwarf state of *A. dilatatum*, and the other, from Ravelston wood, near Edinburgh, having the segments of the frond abruptly truncate, and the habit at first sight altogether peculiar; but an inspection of the original specimens in the Smithian herbarium, proves it to be nothing more than an accidental variety of the same species, namely, *Aspidium dilatatum*, arising from disease, which is shown by the sudden termination of the costæ, and by the partial decay of the other segments. Specimens of the more ordinary state of *A. dilatatum*, gathered at the same time and from the same locality, are similarly affected but in a less degree. The distinctions derived from the fructification in the 'English Flora,' are altogether fallacious, and are partly dependant on the age of the frond, and partly on that of the individual plant. It is clear therefore that the *Aspidium dumetorum* must be erased from the list of species."*

With regard to the Liverpool plants now cultivated by Mr. Shepherd, I had carefully examined them, and found them precisely identical with the plant I am now describing, previously

* Trans. Linn. Soc. xvii. 435.

to the date of Mr. Moore's letter on the subject: but I think there is some little error in supposing that the *identical plant* described by Smith is still in existence. Sir J. E. Smith expressly describes the Liverpool plants as *raised from the seed* of a Derbyshire specimen of *Asp. dumetorum;* and I think all those who have raised ferns from seed, and observed the strange and unexpected results which occasionally take place, will admit that seedlings under any circumstances are far from satisfactory, and in the present instance I find no points of correspondence between the authentic specimens of *dumetorum*, and their supposed descendants. I quote Sir James' observation on the subject. "Mr. Henry Shepherd, of the Botanic Garden, Liverpool, raised the *A. dumetorum* in plenty from seed brushed from a Derbyshire specimen. The individuals, whether cultivated in pots or on rock-work, retain their original habit and characters, the largest not exceeding a foot in height." *

It fortunately happens that the very specimens here mentioned are also preserved in the Smithian herbarium, and the following note is gummed on the folio immediately below them.

"1. ASPIDIUM. — This I raised from seed brushed from the small frond which you sent me from *Derbyshire*, on your return home from Liverpool. You thought it might be a new one. It certainly differs from any British one that I am acquainted with, and appears to keep to the original, as we have it both in pots and on the rock, and there is no difference in either of the plants, these two *fronds* are as large as any the plant has produced, and it does not appear as it would grow much larger. H. SHEPHERD."

The specimens in question are not referrible to *Lastræa recurva* in any of its states, neither do they correspond with the plant which was subsequently recognized by Mr. Moore and myself at Liverpool as identical with that I am now describing; but I may add that they a good deal resemble some seedlings I possess of *L. (multiflora) collina.*

When I first saw this beautiful fern in the North of Ireland, I was in company with Mr. William Bennett, and I instantly pronounced it a species new to Britain. I traced it in many of the

* Eng. Flor. iv. 282.

Irish counties with the same feeling of certainty; and it was only in deference to the judgment of three distinguished botanists, the late Professor Don, Mr. Moore of Dublin, and Mr. Babington of Cambridge, that I at last abandoned my opinion, and consented to give the species as a variety of *dilatata*. Professor Don, although he had frequent opportunities of consulting my somewhat ample materials on the subject, never in any degree wavered from his first opinion; and Mr. Moore and Mr. Babington, who have enjoyed the best possible opportunities of forming an accurate decision, having seen it growing in all states and in an infinite variety of stations, still consider it a mere form of *Last. dilatata*. The testimony of Sir W. Hooker I have already adduced. In adding another species to our list of British ferns, I think it but a matter of justice to my readers to show that I stand opposed to four of our most distinguished botanists. On the other hand, it is no little consolation that I am able to announce the judgment of Messrs. Bree, Borrer and Jenner, as corresponding with my own.

The fronds, on first rising from the earth, are regularly convolute, and when they exhibit the first symptoms of unfolding, the two lower pinnæ are very conspicuous, and their superior size is still more manifest than at a later period. When the frond is entirely unfolded, it is of an elongate triangular form, of a very gracefully curved habit, and about equal in length to the stem, which is clothed with narrow, elongate, laciniated, toothed, brown, concolorous scales, which, in luxuriant plants, are frequently so numerous and so divided as to give the stem a woolly appearance: one of these scales is shown in the right-hand figure at page 214. The stem itself is dark purple in colour, and very hard and woody in texture. The frond is pinnate, and, as in *Polypodium Dryopteris*, *P. calcareum*, *Cystopteris montana*, and all truly deltoid ferns, the lower pinnæ are vastly superior to the rest in size, and very distinctly stalked. The pinnæ are pinnate, the pinnules pinnate, and the lobes again divided and serrated, and all the serratures terminate in short spines. The inferior pinnules are generally larger than the superior, and the first inferior pinnule of the lower pair of pinnæ is vastly superior to all the rest in magnitude. The colour of

the frond is a most lovely green, and its every division is partially concave, giving to the plant, especially when young and barren, a very peculiar and crisped appearance.

I am indebted to the Honorable W. H. Dawnay for pointing out to me that the fronds of this fern are covered with minute, nearly globular, whitish, sessile, glandular bodies, and these probably emit the very obvious scent by which this fern may be readily distinguished from those with which it has generally been confounded. Mr. Dawnay found the plant near Redruth in Cornwall, and was struck by its difference, particularly in colour, from the species last described, without being aware that Mr. Bree had announced it as a distinct species.

The clusters of capsules are circular, and are equally distributed over all the frond; they are partially covered by a slightly convex, reniform, and generally lead-coloured involucre, the margins of which are jagged and uneven, and more or less beset with very minute, globular, sessile glands, similar to those on the frond: this character was first pointed out to me by Mr. Jenner, when we were examining the living plants at Eridge rocks; and I am indebted to that gentleman for much kind assistance in my endeavours clearly to distinguish this species from its congeners. One of these involucres is shown in the right-hand figure on the following page.

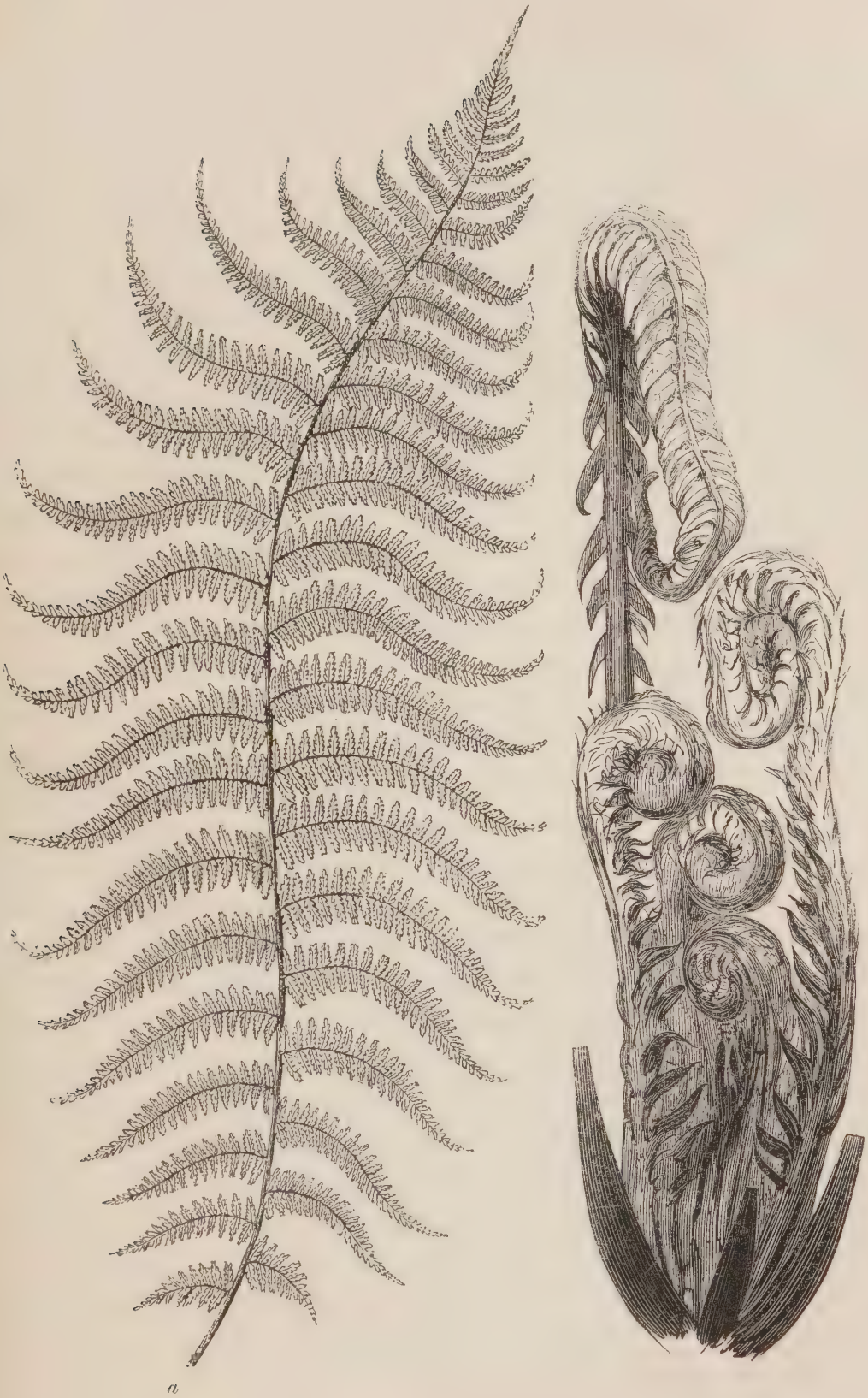
A word remains to be said respecting the name. When in Ireland I spoke of the plant to Mr. Moore by the name of *concavum*, which I merely gave it as a provisional appellation, until we could find out some further particulars concerning it: this, coupled with the fact that Mr. Babington has mentioned the plant as a well-marked variety, probably led to the supposition that he proposed the name, which he himself assures me he has nowhere done; if therefore the name be hereafter remembered at all, it must be as an unpublished synonym, thus: — *Lastræa recurva* = *Aspidium recurvum*, Bree, and *Lastræa concava*, Newman, MS. I may perhaps be pardoned for adding that the word *recurva* does not convey to me an idea of the concavity of pinnules, for which the plant is particularly remarkable.

Contrasted with cognate species, this fern may be known by its triangular instead of linear or lanceolate frond, by its first

pair of pinnæ being much longer instead of shorter than the second, by these being much more distinctly stalked, by the very great length of the first inferior pinnule of its first pinnæ: the absence of stalked glands distinguish it from *multiflora*, the presence of sessile glands from *spinosa*, and the long, linear, laciniated scales of the stem distinguish it from both. In addition to these, Mr. Yarrell, author of the admirable Histories of our British Fishes and Birds, has pointed out to me another character of this elegant plant, namely, the rapidity with which it withers after being gathered. While fronds of *L. multiflora* retain their life and natural freshness for some hours, those of the present species fade in a much shorter time; in this respect being almost equally evanescent with the species of *Athyrium* and *Cystopteris*.

In the above cut the left-hand figure represents *spinosa*, the middle *multiflora*, and the right-hand *recurva*.

spinosa. multiflora. recurva.



LADY FERN, (*a, one-eighth the natural size*).

ATHYRIUM FILIX-FEMINA, Presl, Babington.
Aspidium Filix-fœmina, Smith.
Asplenium Filix-fœmina, Hooker.

THIS fern seems to claim precedence in beauty over every other British species. The exquisite grace of its habit, the elegance of its cutting, and the brilliant delicacy of its colour, combine to render it an object of general admiration. It may, perhaps, require some knowledge of kindred species fully to understand the peculiarities which unite in giving to this fern its superiority over the rest, but dull indeed must be the perception and cold the heart that fails to appreciate its excessive loveliness.

The Lady Fern is distributed more or less abundantly throughout the British islands, its favorite resort being moist and warm woods; but it does not shrink from the exposure of open moors and naked hill-sides, and if sheltered by masses of weather-worn rock, its delicate fronds may often be found developing their fragile pinnules near the summits of the loftiest peaks of our Scottish Highlands. In Ireland it is more abundant although less beautiful than in England: it abounds on all the bogs, and is used as packing for fish and fruit, as we see the Common Brakes employed in this country. On landing at Warren-point, near Newry, I was rather surprised to see what quantities of it were employed in packing the herrings there exhibited for sale.

All the forms found in Britain occur in every country of Europe; and others, very similar, have been found in Africa, Asia, Australia, and the United States of North America. From the last-mentioned country my kind correspondents have sent me three supposed species; but whether these are really distinct from ours, and from each other, I can scarcely venture to pronounce, more especially as the question of species and varieties among our own forms of this fern, is at present undecided.

I have felt so great difficulty in giving by a figure any satisfactory idea of the beauty of this species, that I refrain from any comment on the failures of its other depictors.

The genus of this fern has been made a source of unnecessary trouble and confusion to botanists. Although the accurate Roth

constituted his genus *Athyrium* for its reception, yet our three most eminent British botanists have disregarded his labours. Smith places it in *Aspidium*;* Hooker in *Asplenium*;† and Brown instituted his genus *Allantodia* for the reception of species scarcely distinguishable from ours. The genus may readily be distinguished by the elongate and somewhat sausage-shaped clusters of capsules, the attachment of which, together with that of the involucre which covers them, describes a concave rather than a direct line as in *Asplenium*, and the anterior or free margin of the involucre is slightly incurved. From *Lastræa* this genus differs in having the clusters of capsules linear instead of circular, attached to the side instead of the back of the vein, and the involucre which covers them attached longitudinally instead of transversely on the vein. Its discrepancy from the genus *Aspidium*, as now restricted to a group of ferns possessed of a distinguishing character common to them all, need scarcely be pointed out, since we have no European representative of the genus.

The root is black, fibrous, and wiry. The rhizoma is very large and vertically elongate, sometimes rising several inches above the surface of the ground; in one instance I have seen it more than a foot in height, thus evincing a considerable proximity to the tree ferns of tropical countries. Mr. Ball of Dublin showed me a plant of *Filix-femina* in a Wardian case, in which this peculiarity was very remarkable.

The fronds make their appearance in May; at first their vernation is circinate, but as they advance the apex becomes free, and hangs down as in *Filix-mas*, assuming the appearance of a shepherd's crook: the form of the frond is lanceolate and regularly pinnate, the pinnules are simply toothed, pinnatifid or regularly pinnate. The naked portion of the stem varies from a quarter to a third of the entire length of the frond: it has numerous elongate blackish scales, which are particularly abundant at the base, and more scattered, smaller and scarcely observable on the superior part: the stem is very much swollen at the base.

* Eng. Flor. iv. 282. † Brit. Flor. 443.

The midvein of the pinnules is waved, the lateral veins are forked shortly after leaving the midvein, and the anterior branch of each bears on its side, about midway between the midvein and margin, a linear cluster of capsules, as already described: the anterior free edge of the involucre is split into a series of capillary segments. The frond is extremely tender and fragile, and withers almost immediately on being gathered.

The forms of this fern are so well marked and distinct, that some of the best continental botanists have not hesitated to give them as distinct species.

Linneus considered them as constituting two species: — *Polypodium rhæticum*, which he described as having "bipinnate fronds, with the leaflets and pinnæ remote and lanceolate, and their serratures acuminate;"* and *Polypodium Filix-femina*, "with bipinnate fronds, and acute, pinnatifid and lanceolate pinnules."† Whatever we may have heard in praise of the Linnean characters, I confess that to me they are very often far from satisfactory, and the only inference to be drawn from those I have now quoted, coupled with the existence of authentic representatives of each species in the Linnean herbarium, is this: that Linneus regarded as two species that *family* (so to speak) of ferns, which in Britain, as well as on the continent, we usually designate by the name of *Filix-femina*.

To these Schreber added a third, under the name of *Polypodium molle*, which is described as having the fronds sub-bipinnate, the pinnules lanceolate, somewhat obtuse and crenulate at the apex.‡ This form, as well as some of the others, is described by Weiss, but only as a variety of *Filix-femina*. And the enquiry, even restricted to those authors who treat the forms as species, is sufficiently voluminous without any reference to others who have considered them varieties.

* *Polypodium rhæticum* frondibus bipinnatis: foliolis pinnisque remotis lanceolatis: serraturis acuminatis.—Species Plantarum, 1552.

† *Polypodium Filix-femina* frondibus bipinnatis: pinnulis lanceolatis pinnatifidis acutis.—l. c. 1551.

‡ *Polypodium molle* frondibus subbipinnatis; pinnulis lanceolatis, obtusiusculis apice crenulatis.—Schreber, Spic. Flor. Lips. p. 70, as quoted by Roth.

We next come to the talented but too concise Hoffmann, who increases the number of species to five, but omits *Polypodium rhæticum*. I proceed to translate his specific characters.

No. 10. *Polypodium Filix-femina*. "Frond bipinnate, with ovate serrated and rather obtuse pinnules; their serratures bifid or trifid." *

No. 11. *Polypodium dentatum*. "Frond bipinnate, with ovate-lanceolate, incised, toothed, pinnules; clusters of capsules crowded, ranged in two series." †

No. 12. *Polypodium incisum*. "Frond bipinnate, with narrow linear- or ovate-lanceolate pinnules, whose margin is sharply inciso-dentate: clusters of capsules ranged in two series, crowded, at length confluent." ‡

No. 13. *Polypodium trifidum*. "Frond bipinnate, with linear-lanceolate incised pinnules: their lobes being conniventtrifid, and the clusters of capsules distant." §

No. 14. *Polypodium molle*. Of this Schreber's description, already given, will suffice.

These descriptions, like those of Linneus, are deficient in detail, and we shall scarcely be able to employ them in distinguishing ferns among which so close a similarity prevails.

In 1800 Roth published the third volume of his 'Flora Germanica,' and in this we not only find Hoffmann's views as to the separation of the various forms of *Filix-femina* fully adopted, but the forms themselves carefully and elaborately described. Hoffmann's nomenclature is however only partially adopted.

Roth's species and synonyms are as follow: —

No. 3. *Athyrium molle*.

Polypodium molle of Schreber, Hoffmann, &c.

* *Polypodium Filix-femina*, fronde bipinnata: pinnulis ovatis serratis obtusiusculis: serraturis 2-3 fidis. — Hoff. Deutsch. Flor., ii. 6. The *numbers* correspond with those employed by the author.

† *Polypodium dentatum*, fronde bipinnata: pinnulis ovato-lanceolatis incisis dentatis; fructificationibus biseriatis crassis.—l. c. p. 7.

‡ *Polypodium incisum*, fronde bipinnata: pinnulis angustis, lineari- vel ovato-lanceolatis, margine argute inciso-dentatis, fructificationibus biseriatis crassis, demum confluentibus.—l. c.

§ *Polypodium trifidum*, fronde bipinnata: pinnulis lineari-lanceolatis, incisis: laciniis apice conniventi-trifidis, fructificationibus sparsis.—l. c.

No. 4. *Athyrium trifidum.*
Polypodium trifidum of Hoffmann.
No. 5. *Athyrium ovatum*, Roth.
Polypodium dentatum, Hoffmann, and
Polypodium Filix-femina, Hoffmann ?
No. 6. *Athyrium Filix-femina.*
Polypodium Filix-femina, Linneus.
Polypodium incisum, Hoffmann.
No. 7. *Athyrium rhæticum.*
Polypodium rhæticum, Linneus.

Thinking that some of my readers might consider the whole of Roth's descriptions and observations somewhat tedious, I have reserved them for the Appendix,* restricting my remarks, in this place, to a brief summary of the principal characters of each form, and treating each as a variety rather than a species. The reader who wishes to pursue the subject will do well to study Roth's more elaborate descriptions.

Athyrium Filix-femina, var. *molle.* (See figure *a*, page 244).
Athyrium molle, Roth.

Stalk short, with broad and short scales. Frond usually about eighteen inches in length, semi-erect, bright green, ovate-lanceolate, pinnate, pinnæ pinnate, their midrib winged, the lower pair distant from the rest, short, deltoid and deflexed; pinnules flat, decurrent, united by wing of midrib, their margins toothed: the clusters of capsules are very distinct, there are 5—7 pairs on a pinna.

Athyrium Filix-femina, var. *trifidum.*
Athyrium trifidum, Roth.

This much resembles the last, but is considerably larger, being twice as long and twice as wide; the pinnules are flat and semi-decurrent, not being quite united by a wing of the mid-rib; a slender wing is observable behind each pinnule at its base, but this does not reach to the base of the next following pinnule; the pinnules are more deeply cut, and the apices of the lobes are generally distinctly trifid, the first anterior lobe of each pinnule is larger than the rest. The clusters of capsules, as compared with those of *A. molle*, are smaller and more remote.

* See Appendix, F.

Athyrium Filix-femina, var. *dentatum*.*
Athyrium ovatum, Roth.

This plant seems intermediate between the two which precede it; in habit and size it resembles *A. molle*, but in the structure of the lobes, *A. trifidum*. From *A. molle* it differs in being more rigid, denser, darker in colour, and in having more scales scattered over the ribs: in the pinnules being more ovate and more deeply divided, in the lobes being larger and more diverging, the lower ones are dentate at the margin and trifid at the apex, the upper ones bifid at the apex, all of them are truncated. It will be observed that this combines two of Hoffmann's species, but Roth says they scarcely differ from each other.

Athyrium Filix-femina, var. *incisum*.† (See figure *b*, p. 244).
Athyrium Filix-femina, Roth.

The fronds of this plant often attain a length of four and sometimes five feet, and a breadth of eighteen inches; its rhizoma grows to an immense size, and when perfectly undisturbed for many years in a favorable situation, rises above the surface of the ground, and throws up a most striking and beautiful head of fronds, often thirty or forty in number. The colour, however, in comparison with that of *A. molle*, is much less bright, and indeed is often a dull and obscure green: the pinnæ are very broad, and those in the middle of the frond are often nine inches long: the pinnules are very distinct from each other, and almost, or in some cases quite, pinnate, the lobes being flat, diverging, and sharply toothed; the divisions of the frond being so much more numerous than in *A. molle*, the clusters of capsules are multiplied in proportion, so that instead of presenting a bilinear series, as in that plant, they appear thickly but irregularly scattered over the frond. Roth describes a variety of this plant, distinguished by its smaller size, its narrower and linear-lanceolate pinnules; and this he supposes to be Hoffmann's *Polypodium incisum*. I scarcely entertain a doubt that Hoffmann intended to include both the larger and smaller plants, the differences being quite insufficient to distinguish between them.

* In this instance I adopt Hoffmann's name, as having the claim of priority.

† In this instance I adopt Hoffmann's name, because the name *Filix-femina* being employed for the species will not also serve for the variety.

Pinnæ of *Filix-femina*, (natural size).

a, molle. *b*, incisum. *c*, convexum.

Athyrium Filix-femina, var. *convexum*.* (See figure *c*, p. 244).

Athyrium rhæticum, Roth.

Stalk scarcely a third as long as the frond, and clothed with a few long brown scales: fronds of moderate size, semi-erect, pale yellowish green, linear, pinnate; pinnæ distant, pinnate, midrib not winged; pinnules linear, very narrow, distant, convolute, the edges folding over the clusters of capsules, instead of being flat and spreading as in the forms previously described; their margins are notched rather than toothed, and the divisions from their convexity appear rounded, the clusters of capsules are densely crowded, and when mature become confluent, covering the entire under side of each pinnule. Roth describes a seedling of this species under the name of var. *minus*, of which the fronds are less than a foot in length and of a brighter green colour, the pinnules are more deflexed and still more convolute, and the clusters of capsules, even in the mature state, are less confluent.

A. rhæticum, *var.* minus, (*Roth*).

Smith has described this seedling or starved variety under the name of *Aspid. irriguum;* why he has done so without alluding to Roth's invaluable volume, which, from the frequently recurring quotations, evidently lay open before him, is one of those botanical mysteries which often perplex the enquirer, yet so it is. His description of Roth's *Athyrium rhæticum*, var. *minus*, under its altered generic and specific names, is in these words.

"*A. irriguum*. Brook Shield-fern. Frond lanceolate, doubly pinnate; leaflets oblong, deeply serrated, pointless. Stalk quadrangular. Cover roundish oblong, finally kidney-shaped,

* In this instance I substitute a name of my own, from feeling a doubt whether the plant be really the *rhæticum* of Linneus.

jagged. * * Scarcely one fourth so large as the preceding, of which nevertheless some good botanists have thought it a variety, and indeed, after long cultivation, though raised originally from seed, it considerably approaches that species. In a wild state the fronds are of a more narrow lanceolate figure, and of a paler pellucid green, the main stalk occasionally scaly, but in general quite smooth and exactly quadrangular, though the latter circumstance varies. Leaflets shorter and somewhat less linear than in *Filix-femina*, deeply serrated or partly pinnatifid, their segments sharply cut without bristly points. Masses by the side of the midrib of a few of the lowermost lobes of each leaflet, solitary, oblong, though short and ultimately roundish or oval. Cover at first oblong, soon becoming kidney-shaped or almost orbicular with a lateral notch, flat, thin, membranous and jagged. Capsules dark brown." * Mr. Cameron, of the Botanic Garden at Birmingham, has observed that this plant in cultivation becomes the convex form of *Filix-femina*; and my own experiments confirm his observations.

The late Mr. David Don, in a paper published in the 'Transactions of the Linnean Society of London,' and which I have previously had occasion to quote, writes thus on the forms of *Filix-femina*. "There are two very marked varieties of this plant; the one with broader segments, of a dark green, with the stipes and rachis of a pale purple hue; the other, and that the commonest, with the segments of a more delicate texture, and the whole frond of a pale green. The latter variety varies much in size, according to soil and situation; in damp shady places it becomes the *Filix-fœmina* of 'English Botany,' and in more open exposed situations, the *irriguum;* but neither of these states is entitled to be regarded as a distinct form. A specimen of the larger variety in the Linnæan herbarium, is marked *Polypodium rhæticum*, and with the usual mark of authenticity attached to the specimen." † The first of these forms is the var. *incisum*, the second the var. *convexum*, of the foregoing list.

'The Naturalists' Almanack' adopts, with a mark expressive of uncertainty, three of Roth's species, — *molle*, *Filix-femina*,

* Eng. Flor. iv. 283. † Trans. Linn. Soc. xvii. 436.

and *rhæticum*, omitting *trifidum* and *ovatum*, which indeed appear much to resemble *molle*.

By retaining all these forms under the name of *Filix-femina*, in accordance with the views of Decandolle, Sadler, Hooker and Babington, I rather bow to the views of these eminent botanists than follow any of my own. It seems to me that three at least of the forms described by Roth, those adopted in the 'Naturalists' Almanack,' have the habit and appearance of species; but at the same time I cannot say that the grounds of separation adduced by Roth appear to me satisfactory: neither the scales, involucres, nor position of the clusters of capsules, are adduced as evidence; and surely, before adopting the species, we must learn whether these are dissimilar or identical. Roth is entitled to great praise for what he has done, but it is left for others to earn still greater praise by adducing real diagnostics to corroborate his views.

I am indebted to Miss Beever of Coniston, Miss Browne of Tallantire-hall near Cockermouth, Mr. Thompson of Belfast, Mr. Ogilby and Mr. Moore of Dublin, Mr. Gibson of Hebden Bridge, and Mr. H. Doubleday of Epping, for a great number of fronds from a variety of localities.

For monstrous or deformed states of plants I have little or no taste; yet there are two monstrosities of the present plant, which, from the remarkable character and the remarkable constancy of that character, should scarcely be passed over in silence. The first of these was found at Trevenna in Cornwall, by the late Rev. R. F. Bree, and I am indebted to Mr. Borrer for a frond from his own fernery: the divisions are irregular, but always very narrow and linear. The second, of which I have introduced a figure in the following page, is very beautiful: it occurs in several places in Ireland. I am indebted to Mr. Ogilby, Mr. Mackay and Mr. Moore for specimens; and I have in cultivation a plant nearly resembling it, which was found by Mr. Moore and myself in the county Wicklow. In cultivation both these forms retain all their peculiarities in the same way as the beautiful varieties of *Polypodium vulgare*, a fact which sufficiently proves the necessity for care in drawing inferences as regards the value of species from their constancy under cultivation.

A monstrosity of *Athyrium Filix-femina*.

HUDSON'S SPLEENWORT, (*one-fourth the natural size*).

ASPLENIUM LANCEOLATUM, Hudson.

THIS is a very local fern, and, although not exclusively confined to the sea-shores, must be considered chiefly a maritime species, for, with the exception of the stations in the vicinity of Tunbridge Wells and Snowdon, it has never been found, as far as my information extends, at any considerable distance from the sea. I have recorded below all the localities of this fern which have come to my knowledge: three others, — in Oxfordshire, Shropshire and Yorkshire, — have been recorded, but I think it preferable to omit these, since I believe they have never been verified by a second observer, and were published at a time when the species was very imperfectly known.

CAERNARVONSHIRE.—I found it at two stations in this county; the first on some rocks on the right hand of the road between Tan-y-bwlch and Aberglaslyn, and the second on a rock close to Aberglaslyn. Mr. S. Thompson, guided by my record of

these localities, subsequently found half-a-dozen roots in the first of them. Mr. Wilson informs me that in 1843 he gathered a few fronds of this fern, near my Llanrwst station for *A. septentrionale*, and that it was first observed there by his brother, Mr. H. Wilson, two years previously.

Cornwall. — I am indebted to Mr. Greenwood for some fine specimens gathered near Penzance. Mr. Ralfs informs me it is common in many places near Penzance and St. Ives. Mr. Watson gives me the former of these localities. Mr. D. Peirson informs me he has found it at the Manacles, the Logan rock, &c.

Devonshire. — The Rev. W. S. Hore has obligingly sent me specimens, accompanied by the following habitats : — Morwell rocks, on the banks of the Tamar ; rocks on the Tavy, opposite Virtuous Lady mine ; rocks near Cann quarry, on the banks of the Plym ; and on a damp mud wall at Buckland Monachorum. In addition to some of these localities, Mr. Ralfs informs me he has found it near Tavistock, and by the sea at Salcombe. I am indebted to Miss Griffiths and Mr. Beynon for specimens from Torquay, where it seems first to have been observed by Mr. Beynon in 1842, deeply seated in the interstices of a stone wall — of loose, open construction, and having a southerly aspect — not far above high-water-mark, near the mouth of a small brook about half-a-mile from the town.

Gloucestershire. — Mr. Lees informs me he found it on a wall at Beechly, near the junction of the Severn and the Wye : Oldbury and Court woods have been published as stations ; Mr. Watson adds Pennant rocks near Stapleton, on the authority of Mr. Thwaites ; and Mr. Thwaites himself has published the following note in ' The Phytologist.' — " Mr. J. W. Ewing, of Norwich, who resided here for some time a few years ago, discovered the plant growing on a bank at Stapleton, about three miles from Bristol, and pointed out the spot to me. Not paying much attention to the ferns at that time, the circumstance escaped from my memory, until reminded of it by a friend who was with us at the time. I have recently revisited the spot and again found the plant, but growing there very sparingly ; however, by searching very diligently, day after day, the rocks in

the immediate neighbourhood, I discovered it in one or two other places, and in one of these abundantly, covering the dry surface of a rock completely sheltered from rain, and, though its roots are almost exposed and a slight pull detaches it from the rock, it grows in the greatest luxuriance, one frond which I gathered measuring eighteen inches in length. I have observed in all the fronds of this fern which I have gathered, that the rachis is throughout its entire length furnished with linear scales, a character which best distinguishes it in all its forms, and even in its very young state, from *Asplenium Adiantum-nigrum*."* I am indebted to the Botanical Society of London for a very beautiful series of specimens collected by Mr. Thwaites in this locality, and Mr. Thwaites has most obligingly sent me his own magnificent specimens for inspection.

Kent. — I am indebted to Mr. E. Jenner for specimens from rocks facing the High rocks near Tunbridge Wells, and, conducted by that gentleman, I had the pleasure of seeing it still growing there in August, 1843.

Merionethshire. — The vicinity of Barmouth seems a very favorite locality for this fern. Before I was at all acquainted with ferns, I found it in profusion on an old stone wall between Barmouth and Dolgelly, and was struck with its similarity to, yet distinctness from, *Asplenium Adiantum-nigrum*. I afterwards found it in many localities near Barmouth, particularly on rocks close to the road, on the left on leaving the town for Dolgelly.

Pembrokeshire.—Mr. Lees informs me he found it on Ramsay Island, opposite St. David's, on rocks a little south of the only habitation on the island.

Sussex.—I am indebted to Mr. S. L. Howard for a specimen found on the High rocks, Tunbridge Wells, and to Mr. E. Jenner for others from the same station: under the guidance of the last-named gentleman, I had the pleasure of seeing it growing here in August, 1843. Mr. Borrer and Mr. Jenner have also observed it on rocks in Eridge-park.

Its European range is very limited. Sadler gives it as a native of France, but it does not appear in the 'Flore Française,'

* Phytologist, 75.

which seems remarkable, since Mr. H. Doubleday informs me it is very plentiful on walls and banks in the Channel Islands. He slept on the island of Serk, in a little stone cottage, covered with *Asplenium lanceolatum*, *Adiantum-nigrum* and *Trichomanes*. Mr. Watson informs me he found it in Fayal, one of the Azores, and that Dr. Lemann collected it in Madeira.

The only tolerable figure of this fern with which I am acquainted is in Gerarde's Herbal: * that in Sowerby's 'English Botany' † is more like *Asplenium fontanum;* and that in Mr. Francis's 'Analysis of British Ferns' ‡ rather resembles *Cystopteris fragilis* than the present plant. I do not know Bolton's figure § referred to by Withering.

It is one of those species which has fortunately escaped all confusion in nomenclature: we are indebted to Hudson ‖ for describing and naming it as a distinct species, and I believe all subsequent anthors have adopted his name. It must, however, be observed that our plant is not the *Asplenium lanceolatum* of Hoffmann,¶ an error judiciously pointed out by Weber and Mohr,** that plant being nothing more than a variety of *Asplenium Adiantum-nigrum*. These authors also correctly observe that *Asp. lanceolatum* has never been found in Germany. It appears that our plant was well known to Ray, who describes it as "*Filix elegans Adianto nigro accedens, segmentis rotundioribus.*" †† The only habitats he gives are, first, on the authority of Sherard, "rocks on the north side of the Isle of Jersey," and secondly, on the authority of Bobart, "the porch of Adderbury church in Oxfordshire:" he also adds that it has been found in England by Mr. Woodward, but gives no more precise information. The Adderbury church habitat I have thought better to omit, supposing that *Adiantum-nigrum* was the plant observed.

* Ger. Em. 1135. † Eng. Bot. t. 240. ‡ Analysis, plate v. fig. 2.
§ Bolt. Fil. tab. 17, 2.

‖ *Asplenium lanceolatum* frondibus duplicato-pinnatis, lanceolatis: foliolis alternis; pinnis obovatis inciso-crenatis. Habitat in muris antiquis et rupibus circa St. Ives et alibi in Cornubia copiose.—Flora Anglica, ii. 454.

¶ Hoff. Deutsch. Flor. ii. 12.

** Botanisches Taschenbuch. Deutschlands Kryptogamische Gewächse, p. 41.

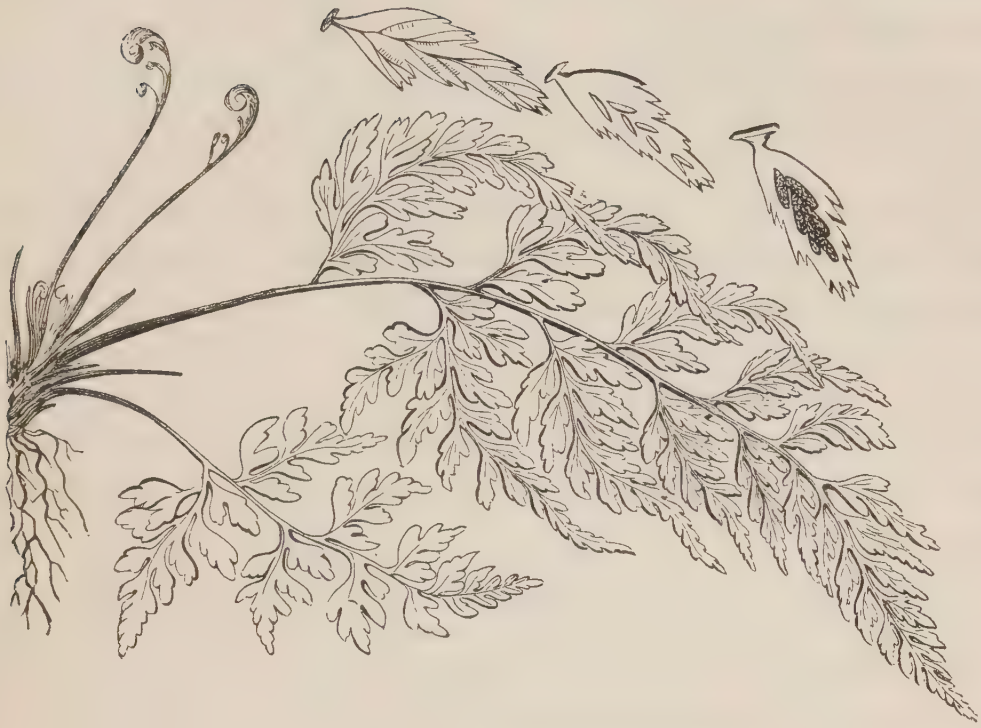
†† Syn. 127.

The roots are black, very long, slender and penetrating; in the fissures of rocks they often run to a great depth, and the plant becomes so completely and firmly wedged that it is a task of great difficulty to obtain a living plant from such situations. The rhizoma is brown, tufted, and densely covered with bristle-like scales; similar scales are also scattered here and there on the stem. The young fronds make their appearance in May, arrive at maturity in August, and remain uninjured throughout the winter; except in seedling plants they are always fertile. The form of the frond is various; in some situations it is of erect growth, nearly linear and simply pinnate, the pinnæ being stalked and lobed: in this state seed is abundantly produced, and the masses when full grown are perfectly circular. Of the three entire fronds represented in the illustration at page 249, that to the right-hand is intended for this variety, and the portions of fronds to the right and left show the situation of the veins, and the mode of fructification; every part of the plant is perfectly flat, and the entire plant rigid. A second variety, of pendant growth and larger size, is lanceolate in form: the pinnæ are pinnate; the pinnules stalked, serrated, and somewhat quadrate. The fronds often measure a foot in length, and sometimes fifteen and even eighteen inches; they usually issue from dark holes or crevices, or depend from the roofs of sea-caves; and the lower pair of pinnæ are often bleached, of small size, weak and imperfect: the surface of the frond is generally flat: the middle frond of the three represents this form, and the detached pinnule immediately adjoining it shows the veins and incipient involucres. A third variety is of nearly erect growth, but bends over at the extremity; and the entire frond, together with each individual pinnule, possesses such a rigid and inflexible convexity, that it is next to impossible to flatten it by pressure: the frond to the left is intended to represent this variety, but the convexity is not expressed.

The lateral veins are branched, a branch running to the extremity of each serrature; the clusters of capsules are attached near the *extremity* of the veins, and somewhat alternately, one branch bearing a mass and the next being without one: each cluster is at first elongate and linear, and covered by a linear,

white involucre; this involucre soon disappears, and the clusters generally become nearly circular and somewhat crowded; they are sometimes so large and crowded when ripe as to be quite confluent.

Contrasted with the ubiquitous species which I shall next describe, *Asplenium lanceolatum* may be known by the relative length of the lower pairs of pinnæ: in *lanceolatum* the first pair is often shorter than the second, third and fourth, but this, as pointed out to me by Miss Griffiths, is far from being universally the case, still they are not longer, the first to the fourth pair inclusive being nearly of equal length and size; in *Adiantum-nigrum*, on the contrary, the first pair of pinnæ are manifestly the longest, and the remainder gradually decrease in length, the form of the frond being deltoid: in *lanceolatum* the pinnæ are somewhat in pairs, although, strictly speaking, not opposite; in *Adiantum-nigrum* they are uniformly alternate: in *lanceolatum* they are set on at nearly right angles with the main stem; in *Adiantum-nigrum* they form an acute angle with the stem; in *lanceolatum* the pinnules are rounder and blunter than in *Adiantum-nigrum*, a character which, as we have seen, attracted the notice of the all-observing Ray: the situation of the capsules on the lateral veins is also different, being in *lanceolatum* much nearer its extremity than in *Adiantum-nigrum*.



BLACK SPLEENWORT, (*half the natural size*).

ASPLENIUM ADIANTUM-NIGRUM, Linneus.

THE Black Spleenwort is universally distributed throughout the United Kingdom, but in some districts far more abundantly than in others: it occurs on rocks as a native habitat, but seems gladly to avail itself of walls, old buildings, ruins and hedge-rows: on ruins it is often very ornamental.

It has been found in every country of Europe, with the exception of Spain; and the form subsequently noticed under the name *acutum* is of frequent occurrence in Africa, Madeira and Teneriffe. A species very similar to the common English form of this plant has been discovered in the United States, but is of such great rarity that the opportunity of forming an opinion on the subject, from a careful comparison of a sufficient number of specimens, has not yet been afforded me. In the absence of such materials I may cite the opinion of Dr. Torrey, who, as Mr. Boott informs me, considers it a distinct species: the plant

to which I allude is described by Beck under the name of *Asplenium montanum*,* and by Michaux under that of *Asplenium Adiantum-nigrum*.†

There are good figures of this fern in Sowerby's 'English Botany,' ‡ Bolton's 'Filices,' § and in many of the continental works.

Concerning the nomenclature of this fern there appears no difference of opinion, the name of *Asplenium Adiantum-nigrum* being assigned to it by general consent.

Its medicinal properties have been celebrated by several of the older writers, but little credence appears to have been given to them by modern practitioners: the catalogue of diseases in which it was prescribed is summed up by Ray in the passage cited below.‖

The root is very black and wiry; the rhizoma tufted, black, and covered with bristly scales: the stem is extremely smooth, shining, and generally of a black or dark purple colour; at its base are a few scattered scales.

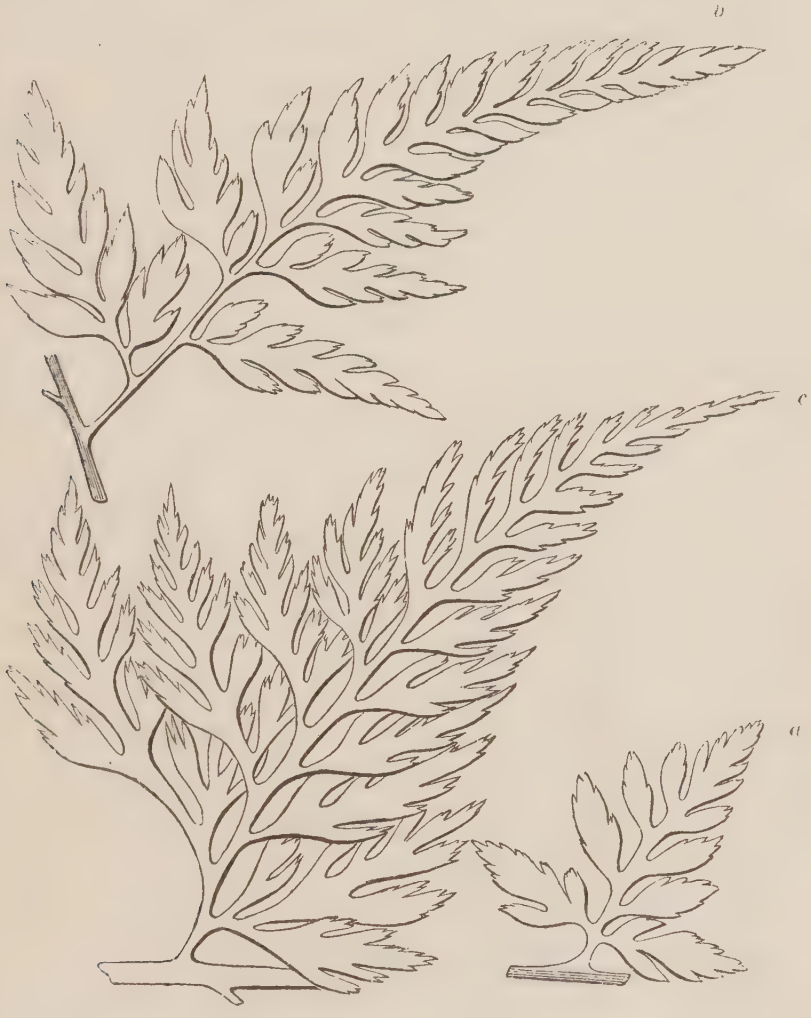
The fronds seldom appear before the end of May or beginning of June: at first their position is nearly erect, but they soon begin to droop, and finally become quite pendulous: they arrive at maturity in September, and continue perfectly green and vigorous throughout the winter, and until the ensuing May, or even June; they are always fertile. The form of the frond is triangular, its apex being acute and attenuated; it is pinnate; the pinnæ are triangular, acutely pointed, pinnate and alternate; the pinnules again are alternate and triangular, and the lower ones often pinnate or pinnatifid, with the lobes notched.

The lateral veins in the pinnules or lobes, as the case may be, are irregularly alternate, and are generally forked after leaving the midvein; and one or both branches of this divided vein bears on its side a line of capsules: these are at first covered by

* Beck, 453. † Michaux, ii. 265. ‡ Eng. Bot. 1950. § Bolt. Fil. tab. 17.

‖ In tussi, asthmate, pleuritide, ictero, obstructionibus lienis prodesse creditur: quin et ad renum et vesicæ dolores valere, * * * calculos et arenulas expellendo: Matthiolus ad puerorum enteroscelas pulverisatum propinat: Hoffmannus in scorbuticis affectibus commendat.—Syn. 127.

a white, linear, narrow, scale-like involucre, also attached to the side of the veins: the clusters of capsules, together with their involucres, are situated rather nearer the midvein than the margin, a character in which they differ from those of the species last described: the involucres open towards the midvein. As the capsules advance towards maturity, the involucre is lifted up and pushed away from its original situation, and finally it entirely disappears; the form of the cluster of capsules is then lost, and, in very fruitful examples, the clusters become confluent, and nearly cover the underside of the frond.



Pinnæ of *Adiantum-nigrum,* (natural size).

a, obtusum. *b*, officinarum. *c*, acutum.

The superior length of the lower pinnæ, — the oblique angle at which these, and indeed all the pinnæ, are attached to the

stem, thus giving to the frond its acutely deltoid form, — and lastly, the different situation of the pinnules, — are characters which readily distinguish the present from the last species.

There are three very marked forms of this fern. I have drawn the lowest pinnule of each of these exactly of the natural size, in order to afford a better opportunity for examining and contrasting their characters. Whatever may be the true value of these forms, whether they be more correctly described as *species* or *varieties*, I will not attempt to say; but I trust I am correct in saying that the distinguishing characters hitherto published are scarcely sufficient for the establishment of the former: I therefore adopt the same plan as in *Filix-femina*, and treat them for the present as varieties only.

Asplenium Adiantum-nigrum, var. *obtusum*. (See fig. *a*, p. 257).

Asplenium obtusum, Willdenow?

This form of the plant appears to be the *Filix pumila petræa nostras* of Plukenet, as quoted by Dillenius in the third edition of Ray's 'Synopsis;'* and the *Asplenium obtusum* of Willdenow's 'Species Plantarum,'† and of Sadler's work on the Ferns of Hungary.‡ Concerning the plants of these three authors I am compelled, however, to acknowledge that my means of judging are very imperfect, and I have given in the Appendix§ the whole of Sadler's descriptions and references, not only as regards the present, but also the following forms. The name of *obtusum* seems to have been given in Kitaibel's MS. work on the Ferns of Hungary, now in the library of the Hungarian Museum of Natural History. The principal characters appear to exist in the winged stem, smaller size, blunter divisions, and in the whole frond being much less divided. Sprengel considers it a variety of the next rather than of the present species.

Asplenium Adiantum-nigrum, var. *officinarum*. (See fig. *b*).

Asplenium Adiantum-nigrum, Sadler.

This, although placed here as a variety, is the usual form,

* Filix pumila petræa nostras, Adianti nigri foliorum æmula, saxorum interveniis prorumpens.—*Pluken. Am.* 91. In montosis Sussexiæ observavere D. Manningham et D. Dillenius. Videtur ad Adiantum-nigrum officinarum pertinere et hujus saltem junior planta esse.—Syn. 127.

† Sp. Plant. v. 341. ‡ De Filicibus Veris, &c., p. 30.

§ See Appendix G.

and appears to me exactly intermediate between the two others. It is the *Adiantum nigrum officinarum*, Common black Maidenhair or Oak fern, of Ray's 'Synopsis.' Sadler makes its distinguishing character to consist in the stem being *not* winged.*

Asplenium Adiantum-nigrum, var. *acutum*. (See. fig. *c*, p. 257).

Asplenium acutum, Bory.

Sprengel, Willdenow and Sadler, all of them give an *Asplenium a utum*, which I think must be identical with Ray's *Filix minor longifolia*,† described from specimens found on the mountains of Mourn, in the county of Down, in Ireland. Dillenius, the editor of the edition of Ray's 'Synopsis' from which my quotations are made, expresses a doubt as to its distinctness as a species, since no fructification had been observed, and suggests the possibility of its being a variety of *Adiantum-nigrum*, indebted for its peculiarities to the fact of its growing in a cave into which the solar rays could not enter.‡ Smith, who makes it his var. β. of *Adiantum-nigrum*, informs us that Sherard's original specimen is preserved in the herbarium at Oxford, that it is truly elegant, of a delicate membranous texture, the leaflets palmate and finely laciniated, and that no fructification is discernible.§ Mr. Wilson and Mr. Mackay have found this variety at Killarney. "I found," says Mr. Mackay, "in 1805, on the limestone rocks at Mucruss, a beautiful and delicate variety [of *Adiantum-nigrum*], with fronds tripinnate throughout, or with pinnules deeply and finely laciniated; it was subsequently found by Miss Hutchins and Dr. Taylor, and Mr. W. Andrews lately gave me a specimen collected by him, in 1835, on a mountain called Cahir Conree, six miles from Tralee."‖ I am indebted to Miss Carpenter, of Bristol, for an opportunity of seeing and carefully examining a specimen gathered near Cork; the lowest pinna of the frond is

* Rhachi non alata.—De Filicibus Veris, &c., p. 31.

† Filix minor longifolia tarsis raris, pinnulis longis tenuissimis et oblongis, laciniis fimbriatis D. Sherard.—Syn. 127.

‡ In hac planta seminalia nulla observare contigit unde an species vere distincta sit, dubium videtur. Forsitan non nisi varietas est Adianti nigri officinarum J. B. loci ombrositati originem debens, nam in spelunca, quam radii solares nunquam illustrabant, nascebatur. Sane vero si varietas sit, singularis ea est et valde speciosa.—l. c.

§ Eng. Flor. iv. 298. ‖ Flor. Hibern. 342.

represented at page 257, figure *c*. This specimen was I believe gathered by Dr. Allmann, from whom I have received an interesting note on the subject. "There may be some doubt," writes Dr. Allmann, "as to the necessity of considering it separately from the common form of *Adiantum-nigrum*, for though the extreme forms are so remarkably distinct as to strike the most casual observer, yet these extremes are connected by such numerous gradations, by which they run into each other, that I believe it to be impossible to say where the more common variety terminates and the rarer one commences: the great elegance, however, of *well-marked specimens* of the rarer variety, and the facility with which they may be distinguished from the common form, seems to render a separate notice of the fern desirable." Mr. Mackay, when recently in London, informed me that under cultivation he had found this plant return to the usual form. I entertain no doubt that the plant thus noticed by Ray, Dillenius, Smith and Mackay, and also by Miss Carpenter and Dr. Allmann, and of which a specimen is now before me, is identical with the *Asplenium acutum* of Bory, Sprengel, Willdenow and Sadler.

RUE-LEAVED SPLEENWORT, (*natural size*).

ASPLENIUM RUTA-MURARIA, Linneus.

The Wall Rue, or Rue-leaved Spleenwort, is one of those plants, which, like our half-domesticated birds, — the sparrow, the swallow, and the martin,—seem to have deserted their native

wilds, and to have taken up their residence amongst the habitations of men. It is abundant on ruins and old churches, and has a strong predilection for brick walls, although Sir J. E. Smith makes Ray assert "that it dies whenever it gets upon burnt bricks."* The original passage is "*Lateribus coctis immoritur:*"† Dillenius either used the verb *immorior* as Horace does in *immoritur studiis* — "he is always at his books," or he may have written *immoratur* — "it lives on brick walls," thus pointing out its *favourite* locality: so carefully observant a man as Dillenius must have frequently seen it flourishing in the crumbling mortar, filling the interstices of brick buildings: we need wander no further from London than the wall of Greenwich park, to see it flourishing abundantly on bricks.

Throughout the northern, western, and southern counties of England, and also in Wales, Scotland and Ireland, this fern is to be found on almost every ruin, but, as regards England, far less abundantly in the eastern than in the western counties. In a perfectly wild state, it grows abundantly on the rocky hills in Scotland, particularly on Arthur's seat, near Edinburgh; in the Peak district of Derbyshire; on Cader Idris, and Snowdon more sparingly.

It is generally distributed over the continent of Europe, preferring towns and buildings to the open country: I am indebted to Mr. Lea for specimens from the United States.

Of our figures of this fern I cannot speak in high praise. Concerning its nomenclature no difference of opinion appears to have arisen.

Lightfoot informs us that this plant was formerly sold as a pectoral, and recommended in coughs, asthmas, obstructions of the liver and spleen, and in scorbutic complaints.‡

The roots of *Asplenium Ruta-muraria* are wiry and black; the rhizoma is black, tufted, and clothed with bristly scales: the fronds make their appearance in May and June, arrive at maturity in September, and continue perfectly green throughout the winter, and until the ensuing May; they are always fertile.

The stem is black or dark purple, very smooth and shining,

* Eng. Flor. iv. 297. † Dillen. in Syn. 122. ‡ Lightfoot, Flor. Scot. ii. 666.

and for more than half its length naked. The normal form of the frond is triangular and pinnate, the pinnæ being alternate and also pinnate; the pinnules are of varied form, but mostly somewhat lozenge-shaped; they are stalked, and resemble so many little leaves; their exterior margin is generally serrated or crenate.

The veins radiate from the stalk to the exterior margin of the pinnule, and to them are attached the elongate lines of capsules, two, three, four, and even five on a pinnule; these are at first covered by an elongate, linear, white involucre, the free margin of which generally faces the median line of the pinnule, and is jagged and uneven; this is soon pushed aside by the swelling capsules, turned back, and finally lost, the back of the pinnule becoming eventually nearly covered by a dense, dark brown mass of seed.

Observation on Asplenium germanicum.—The fronds from which the outlines in the margin were sketched led me to suppose that *Asplenium germanicum* was but a form of *A. Ruta-muraria*. Mr. Wilson tells me that this conclusion was drawn too hastily, and I gladly yield to so high an authority, more especially as Mr. Wilson's opinion seems in unison with that expressed by nearly all the continental botanists. Truth should be the only object of the naturalist; and when, in diligently seeking it with perfect singleness of purpose, his own judgment proves an insufficient guide, it seems but reasonable that he should avail himself of the assistance kindly offered him by others, whose opportunities of observation have been more extended, and whose ability to arrive at a just conclusion is greater than his own. The pleasure an author may be supposed to feel in making the catalogue of his country's productions as full as possible, has also perhaps some little weight, but I am so fully aware that this propensity becomes dangerous when injudiciously indulged, that I endeavour as much as possible to resist its influence. The question of the exact value of differences has hitherto scarcely obtained sufficiently careful attention, but I doubt not the time will arrive when we shall be more united on this difficult point.

† WEISS' SPLEENWORT, (*natural size*).

ASPLENIUM GERMANICUM, Weiss.

Asplenium alternifolium, Smith, Hooker, Babington.

THIS is one of the rarest — perhaps the very rarest — of our British Ferns. It has never yet been found in England, Wales or Ireland; and three Scotch localities are all that I am able to record.

FIFESHIRE.—Sir W. J. Hooker informs us, on the authority of Dr. A. Dewar, that it occurs three miles from Dunfermline.

PERTHSHIRE.—I am indebted to Mr. Williamson of the Royal Botanic Garden, at Kew, for a specimen found in December, 1843, on Stenton rocks, near Dunkeld, in this county. The locality has previously been recorded, but the plant was supposed to have been extirpated many years since.

ROXBURGHSHIRE. — It appears to have been first noticed by Mr. Dickson, as recorded in the Linnean Transactions,* on "rocks in the south of Scotland." Smith adds, "some sunny rocks about two miles from Kelso on the Tweed."† I do not

* Trans. Linn. Soc. ii. 290. † Eng. Bot. 2258.

observe a British specimen in the Smithian herbarium, although I quite understand Smith as saying he received it from Dickson.

It appears to be nowhere common on the continent, but has been found here and there on rocks and walls in Sweden, Hungary, Germany, France and Italy. Beyond the limits of Europe I am unable to trace its range.

There is a beautiful figure of this fern in Jacquin's 'Miscellany,'* accompanied by a description by Wulfen; those in Sowerby's 'English Botany' † and Mr. Francis's 'Analysis' are not so good.

Concerning the name of this fern there appears a variety of opinions. It is the *Asplenium germanicum* of Weiss, published in his 'Plantæ Cryptogamicæ,'‡ in 1770, and adopted by Sprengel, Willdenow, Hoffmann, Decandolle and Sadler, so that, besides having the claim of priority, this is the current name on the continent of Europe. It is the *Asplenium alternifolium* of Wulfen, published in Jacquin's 'Miscellany,' in 1781, as above cited, and adopted by Roth, Withering, Smith, Hooker, Francis and Babington. It is the *Asplenium Breynii* of Retz,§ published subsequently to 1772, but I cannot learn the exact date, and adopted by Weber and Mohr, and Swartz. Sir J. E. Smith, in justification of his adopting the later name of *alternifolium*, writes thus.—"The nomenclature of this species, a native not only of Germany, but of Switzerland, Sweden and Scotland, evinces the folly of specific names taken from any particular country, but more especially *the still greater folly of restoring old names which had been laid aside on account of their badness*, and long since forgotten."‖ I join with Hoffmann, Willdenow and Decandolle, in deserving this reproach, and adopt the name, as they do, supposing it to possess the claim of priority; not that I constitute myself a judge of its quality. If authors generally held themselves justified in selecting names by their goodness or badness, we must bid a long farewell to all hopes of a uniform nomenclature: the very suggestion seems to me to be fraught with danger to the science.

* Jacq. Misc. ii. tab. v. fig. 2, p. 51. † Eng. Bot. 2258.
‡ Plant. Crypt. 299. § Obs. Bot. fasc. 1, p. 32.
‖ Eng. Flor. iv. 296.

I need not repeat my doubts as to *Asplenium germanicum* being a distinct species; it is sufficient that so many excellent botanists have thought otherwise. I have much pleasure in quoting the following observations of the Rev. T. Bell on this subject.

"I am aware some botanists have remarked, that attenuated forms of *Asplenium Ruta-muraria* approach indefinitely near *A. alternifolium*. I believe the two species have occasionally been confounded, but I always regarded this as a mistake into which no one could fall who had *perfect* specimens before him, and who was not prepared to substitute the general aspect and habit of the plants for their specific characters. As Mr. Newman, in his recent publication on Ferns, has fallen into this mistake, and conjoined the species, I think it not out of place to communicate to the Botanical Society the following brief observations:—

"The first character is taken from the form of the frond, which is correctly stated by Sir William Hooker to be bipinnate in *A. Ruta-muraria*, and, in *alternifolium*, pinnate, the lower pinna ternate; the pinnæ in both being alternate. Now so far from its being the tendency of attenuated or contracted forms of *A. Ruta-muraria* to approach the pinnate form of *alternifolium*—the truth of the matter is, that the more attenuated the former is, the more distinctly bipinnate does it become, or in other words, the nearer *A. Ruta-muraria* approaches *alternifolium* in its general aspect and habit, the further and more visibly does it diverge in *this* character.

"The second character is taken from the indusium, with regard to which it is hardly necessary to remark, that while that of *alternifolium* has a smooth even edge, the edge in all varieties of *Ruta-muraria* is invariably jagged or uneven, and this is quite visible to the naked eye."*

Without at all attempting to undervalue these observations, I would just observe that the peculiar form of frond had been previously well described in the Floras of France and Germany, and the character of the involucre pointed out by several authors.

* Transactions of the Botanical Society of Edinburgh, vol. i. pt. ii. p. 119.

In our own country I would cite Sir W. Hooker, who says, "Involucre entire,"* and Mr. Francis, who still more explicitly observes, "Indusium entire on the margin."†

The roots are black and wiry; the rhizoma rather elongate; the stem dark at the base, but green above; the frond very narrow, linear and pinnate; the pinnæ regularly alternate, distant, ascending, somewhat pear-shaped, notched at the apex, and sometimes also at the side; the united apical portion of the frond is generally larger and also more pointed than either of the pinnæ; the pinnæ, as in the last species, are without a mid-vein; they have two, three, or four sub-parallel, longitudinal veins, and on each of them is usually situated a line of capsules, which, as far as I have observed, is covered by a linear, somewhat inflated and persistent involucre, which is slightly arched over the capsules, opens towards the median line of the pinna, and has a sinuous but not jagged free margin.

The opinion of Linneus appears to have been in favour of combining the two forms: in order to exemplify this I shall quote an observation of M. Jacquin's, which stands in his 'Miscellanea Austriaca,' appended to Wulfen's paper already cited, and which is entitled 'Plantæ rariores Carinthiacæ.' Alluding to *A. germanicum*, there described as *A. alternifolium*, he writes thus.—"Plantulam hanc jam olim crescentem inveni in Austria, circa Glocknitz, in rupibus calcareis, etiam mixtim cum Acrosticho septentrionali. Cum beatus Linneus, quocum communicaverim, *mordicus sustineret meram esse Rutæ murariæ varietatem*, non ausus fui pro nova specie proponere, et omiseram in stirpium agri Viennensis enumeratione."‡ From this passage it will, I think, appear, that if previously in error, I have at least the satisfaction of having erred in excellent company. I must not, however, be understood as considering Linneus unexceptionable authority on such a subject, since subsequent observations have, in several instances, clearly proved that some of his species were far too comprehensive.

This little fern appears to do well in cultivation; the roots are probably obtained from Germany or the South of France.

* Brit. Flor. 442. † Analysis, 45. ‡ Jacq. Misc. l. c.

FORKED SPLEENWORT, (*natural size*).

ASPLENIUM SEPTENTRIONALE, Hoffmann.

THIS is one of the rarest of our British ferns: it occurs only in the fissures of rocks, and the interstices of stone walls: in the latter it appears to thrive more luxuriantly, probably from the frequently exposed situation and elevation of the former. I think I have seen specimens from nearly all the recorded stations, and none of them are equal in luxuriance to those which I found by the farm-yard at Llanrwst, which, being on the Conway and not far from its mouth, is but slightly elevated above the level of the sea. At Llanrwst the tufts of this fern were very large: one of them was so heavy, that after shaking out all the loose earth, I found it a very inconvenient load to carry even the single mile which I had to convey it: this tuft, consisting I suppose of but one rhizoma, had upwards of three hundred perfectly vigorous fronds, besides at least an equal number of decaying ones, the relics of the previous year. Gerarde, who calls it *Muscus corniculatus*, says, "there is found vpon the tops of our most barren mountaines, but especially where sea Coles are accustomed to be digged, stone to make iron of, and also where ore is gotten for tinne and lead, a certaine small plant: it riseth forth of the ground with many bare and naked branches, diuiding themselues at the top into sundry knags like the forked hornes of a Deere, every

part whereof is of an overworne whitish colour." * Modern botanists do not seem to have met with this fern in mining districts, but the hint is worth reviving.

Besides the English and Welch localities given below, it is said by Jacob, in his 'Plantæ Favershamienses,' to grow on the north side of Bocton church, in Kent; but I quite agree with the authors of the 'Botanist's Guide' in supposing that Mr. Jacob mistook *Ruta-muraria* for the present plant.

Caernarvonshire. — Ray records that this fern was found by Mr. Llwyd on the summit of Carnedd Llewelyn.† Mr. Wilson has found it near Llyn-y-cwn, and Mr. Babington on rocks near the pass of Llanberis: I had the good fortune to discover it in profusion on a loose stone wall, about a mile from Llanrwst, on the Conway road; the locality is on the left hand, looking towards Conway, and exactly opposite a small farm-yard. Several botanists have visited the place subsequently, and taken it away in such quantities as nearly to destroy the habitat, — so nearly indeed that others have been unable to discover a trace of its former existence. I deeply regret the prevalence of this exterminating spirit, for it tends to deprive the true botanist of one of his greatest pleasures, — that of visiting rare plants in their native localities. It however affords me some satisfaction to know that the plant has been lately observed by Mr. Wilson on the same wall, two hundred yards nearer Conway, and that it grows in many other spots in the neighbourhood.

Cumberland. — Mr. Heysham informs me that in 1837 and 1838 he found this fern on Honister crags, and on crags in the vicinity of Scaw Fell. Hutchinson gives Patterdale and Keswick as localities. Turner and Dillwyn, on the authority of Mr. Wood, say it has been found in a ravine of the Screes, near Wastwater, about 600 feet in perpendicular height; and Mr. Francis informs us that it occurs sparingly on rocks between the vale of Newlands and Borrowdale.

Denbighshire. — It is recorded by Ray that Dr. Richardson found it on old walls at Llan Dethyla, about a mile from Llanrwst

* Ger. Em. 1561.

† Ad cacumen montis Carnedh-Lhewelyn prope Lhan-Llechyd in agro Arvoniensi invenit D. Lhwyd.—Syn. 120.

towards the north.* Turner and Dillwyn place this habitat in Denbighshire: the possibility of its being in Caernarvonshire, and identical with that I have recorded as discovered by myself, has often occurred to me.

NORTHUMBERLAND.—It is said to have been found on Kyloe crags in this county.

SOMERSETSHIRE.—In Sole's MS. Flora of Somersetshire, *Asplenium septentrionale* is described as growing abundantly on Blackford hill. Turner and Dillwyn also inform us, on the authority of Mr. Brown, that it occurs plentifully on the south side of Blackford hill. Mr. N. Ward found it plentifully on loose stone walls in the parish of Culbone, about six miles from the boundary of the county, and at an elevation of about 1000 feet above the sea: he has kindly contributed a liberal supply of specimens from this locality to my collection. It has also been found in profusion by the Rev. W. S. Hore, on a loose stone wall, two miles north of the parish-church of Oare: perhaps this is identical with the locality discovered by Mr. Ward.

WESTMORELAND. — Hudson records that it has been found on mountains above Ambleside, in this county.

YORKSHIRE. — Hudson records that it has been found by Mr. Tofield on Ingleborough.

It occurs in two Scotch counties.

EDINBURGHSHIRE. — Ray † records that it was observed by Thomas Willisell on the rocks in Edinburgh park. This I presume to be identical with Arthur's seat, a locality often recorded, and one in which the plant still exists. Smith says it was also abundant at the Hermitage, by Blackford burn, near Edinburgh, in 1782. I am indebted to Dr. Greville, Dr. Balfour, and Mr. Ray of Epping for specimens from the vicinity of Edinburgh.

PERTHSHIRE.—I am indebted to Mr. Williamson of the Royal Botanic Garden, Kew, for specimens gathered by Mr. Henderson at Stenton rock, near Dunkeld, in this county.

I have never heard that this fern has been found in Ireland.

* In muris antiquis Lhan-Dethylæ uno circiter miliari a Lhan-Roost aquilonem versus.—Ray, Syn. 120.

† Syn. 120.

Asplenium septentrionale occurs most abundantly in Hungary, some parts of Germany, and the south of France: it is also recorded as an inhabitant of Lapland, Sweden, Denmark, Spain and Italy. In the north it seems very rare; in the south much more common. I believe it has not yet been observed beyond the limits of Europe.

The figures of a fern so very marked are of necessity characteristic: I scarcely know one by which the species may not instantly be known.

The specific name of *septentrionale* appears to have obtained the concurrence of all botanists, but the genus has been a matter of difficulty and doubt. We find our earliest authors properly referring this plant to the ferns. We have seen that Gerarde considered it a moss; and the opinions of himself and other authors are thus summed up by his emaculator, Johnson:—"Our author formerly gave another figure of this plant by the name of *Holosteum petræum*, which I have omitted, thinking this the better. Tragus,* Lonicerus and Bauhine,† refer this to the fernes, and the last of them calleth it *Filix saxatilis corniculata*. Pena and Lobel ‡ made it their *Holosteum alterum*. Thalius calls it *Adiantum Acrostichon seu furcatum*."§ Ray calls it *Filix saxatilis Tragi*,‖ and Linneus,¶ followed by Hudson, Bolton, Berkenhout, Withering, and several others, denominates it *Acrostichum septentrionale*, but Withering observes that when young it is an *Asplenium*. Roth removes this species, together with *Aspl. germanicum* and *Aspl. Ruta-muraria*, to the genus *Scolopendrium*, which also includes *Scol. vulgare* and *Ceterach officinarum* of the present work. His character of this comprehensive genus is given below.** It seems scarcely my province, in a work like the present, to propose new generic divisions; but I shall perhaps be pardoned for stating that *Ruta-muraria*, *germanicum* and *septentrionale*, form a group very distinct from the other British species, inasmuch as their pinnules appear to

* Tragus, Hieron, 537. † Bauh. Hist. iii. part ii. 747. ‡ Lobel, Ic. 47.
§ Ger. Em. 1561. ‖ Syn. 120. ¶ Sp. Plant. 1524.

** Capsulæ in lineolis sparsis, geminis, interveniis, disco frondis subjectis annulo articulato cinctæ. Involucra superficiaria, sibi invicem longitudinaliter incumbentia, sutura longitudinali dehiscentia.—Roth, Flor. Germ. iii. 47.

want the mesian nerve or midvein, which is always present in the rest: hence the group might perhaps be called *Amesium*.

The roots are very long, fibrous, crooked and intertwined, and, together with the rhizoma, which is very large and tufted, form an amazing bulk.

The fronds make their appearance in March and April, arrive at maturity in August, and remain green throughout the winter; they grow in a horizontal position from a perpendicular surface. The fronds represented at page 269 are in the natural position. The form of the frond is elongate, lanceolate, and furnished laterally with one or two short bifid teeth or serratures, and the apex also terminates in a bifid point: it diminishes imperceptibly towards the base, and there terminates in a smooth stem, which is black at the extreme base.

The veins are nearly simple, and few in number, one running into each serrature. The capsules are attached to each vein in a continuous line, covered at first by an involucre of similar shape, which opens towards the middle of the frond, and, as the capsules swell, is thrown back, and finally lost, and the lower surface of the frond then presents a continuous mass of capsules.

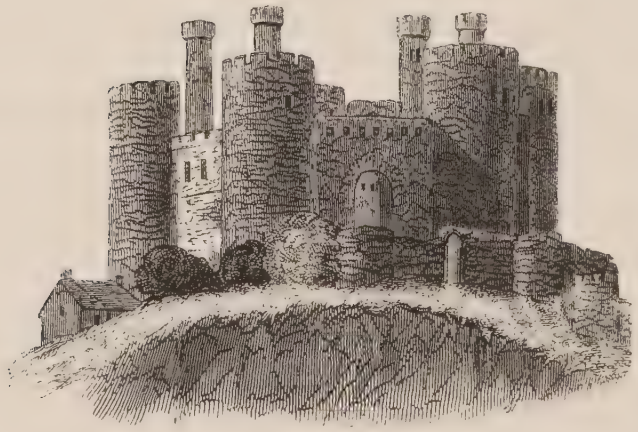
Roth describes the involucre as double,* but this, although

* "*Observ. I.* Foliolum (vel lacinia) fructiferum lineis duabus plerumque, in prona pagina depressis et exaratis, in aversa elevatis præditum est. Duabus hisce elevatis lineis, quæ vero neutiquam nervi sunt, paginæ aversæ affiguntur capsulæ secundum longitudinem, numerosæ. Inter has lineas capsuliferas et marginem oritur *Involucrum* duplex, longitudinale, continuum, membranaceum, tenuissimum, albidum, valvulis in medio secundum longitudinem ante maturitatem arcte sibi incumbentibus et capsularum duplicem seriem arcte includentibus. Hoc in conspectum veniet cuique observatori, quando laciniam frondis fructiferam, involucro adhuc tectam, dorso lineam depressam inter et marginem longitudinaliter findat. Maturescentibus capsulis magisque elevatis involucrum secundum totam longitudinem in medio dehiscit, quod ob copiam capsularum cum elasticitate sese effundentibus, non raro rupturas transversales irregulares patitur. Replicatis tunc involucri valvulis effusæ capsulæ totam laciniæ inferiorem paginam obducunt et ita *Acrostichi* speciem mentitur planta, quæ verum est *Scolopendrium*.—Roth, Flor. Germ. iii. 50.

certainly the case as regards the apical portion of the frond, is not so with the basal portion. In a foot-note on the preceding page I have quoted Roth's observation on this structure, thinking that botanists will be interested in perusing it.

This fern is so very different from every other British species, that there is not the slightest danger of any confusion occurring in this way. On the other hand, its similarity to the Buck's-horn Plantain (*Plantago Coronopus*) is so great, that a superficial observer might well be excused for mistaking it for that plant. Although occasionally established in lofty and exposed situations, it can scarcely be considered a hardy species, since it is very susceptible of cold, its young fronds being injured by a slight frost, as noticed by Mr. Watson.

The vignette below is from a hasty sketch of Conway castle, a building which, by situation, is somewhat associated with the principal British locality of this curious little fern.



SEA SPLEENWORT, (*the Liverpool plant, natural size*).

ASPLENIUM MARINUM, Linneus.

THIS fern is, as its name implies, essentially a marine species, rooting deeply in the fissures of sea-cliffs, or clothing the roof of sea-caves, in the darkest recesses of which it seems to luxuriate. Its range in Great Britain is very extensive, but confined entirely to those counties which are washed by the sea. In the following brief summary of English and Welsh localities its almost total absence from the eastern coast is worthy of remark.

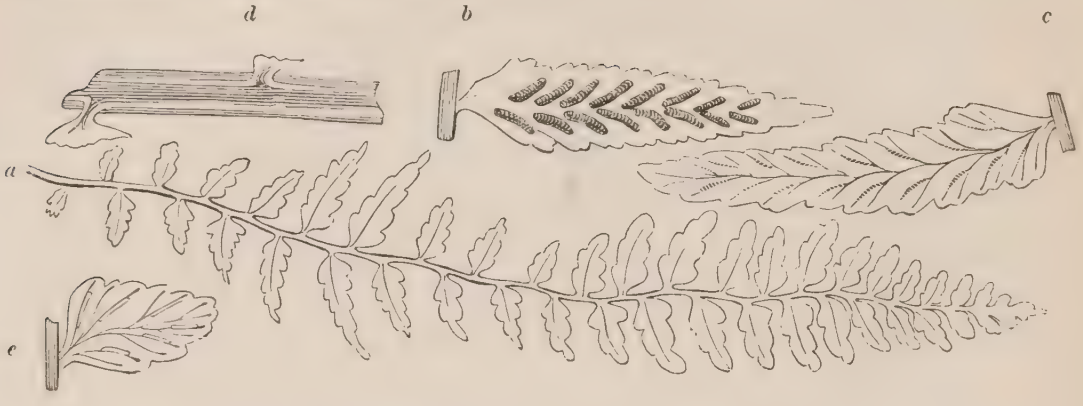
ANGLESEA. — We learn from Ray that it occurs on the rocks about Priestholm island and at Llandwyn; the Rev. Hugh Davies says it is common on the rocks; and Mr. Watson gives me the South Stack as a locality.

CAERNARVONSHIRE. — Mr. Pinder informs me he found it on the Eagle-tower in Caernarvon-castle; and Mr. Wilson has found it at Orme's head.

CARDIGANSHIRE.—In many places: I found it very fine on the Castle-rock, and on the Castle-wall at Aberystwith.

CHESHIRE. — I found it on the rocks called the Red Noses at New Brighton; and Mr. Wilson and Mr. Watson have subsequently given me this as a station. Dr. Wood informs me that "on the rocks of Hilber island, at the mouth of the river Dee,

on the coast of Cheshire, this species is met with in great quantities."—*Phytologist.*



a, Cornish specimen of *Asplenium marinum*, one eighth the natural size. *b* and *c*, pinnæ of the same of the natural size; *b*, showing the linear clusters of capsules, *c*, the veins; *d*, a portion of the main stem. *e*, a pinna of the Liverpool plant in a young state, showing the veins and involucres.

Cornwall. — In this county the Sea Spleenwort is abundant and luxuriant. Miss Warren informs me that it grows both on the northern and southern coasts: and that it is particularly fine near St. Ives. Mr. Ralfs says it is fine and abundant at Mousehole. Messrs Watson, Greenwood, Peirson, H. Christy, &c., have given me numerous other localities, almost comprising the entire coast. The form of the frond in Cornish specimens is more elongate than in those from Liverpool, and the habit altogether different.

Cumberland. — Mr. Heysham informs me he has found it near Whitehaven; and Mr. Pinder has supplied me most abundantly with beautiful specimens, both from this place and St. Bees' head.

Devonshire. — Miss Griffiths gives me Dawlish and Ilfracombe as localities. The Rev. W. S. Hore informs me it is common in sea-caves; Mr. Ralfs has found it at Torquay and Salcombe. Mr. Beynon informs me that it grows in cavernous fissures of the rocks in many parts of the coast near Torquay,—for instance, Liver-mead, Daddy-hole, Mead-foot, and Hope's-nose. Mr. Sparkes observed it in a sea-cave at Babbicombe; and Mr. Jordan between Dawlish and Teignmouth.

Dorsetshire. —"Rocks and cliffs in the Isle of Portland: Sir T. G. Cullum. In Purbeck in various places: Pulteney." *Botanist's Guide.* I have seen specimens from Lyme Regis.

Durham.—Mr. Watson gives me Marsden rocks as a locality, on the authority of Mr. Bowman. Mr. Winch says it is also found on rocks near Marsden rocks. "Black-hall dean, west of Hartlepool: Rev. J. Dalton. Near Southwick: Mr. Brunton." *Botanists' Guide.*

Glamorganshire.—I learn from Mr. Dillwyn and other botanists, that it occurs in the following localities: — near Neath; Mumbles light-house; between the Mumbles and Penyard-castle; near Swansea; near Dunraven; near Oystermouth; on Barry island, coast of Gower; and plentifully in Bacon's hole.

Lancashire.—I believe Bolton first observed this fern in the Winwick stone-quarry, near Warrington. Mr. Wilson informs me it still grows there, but is always of small size, and rarely produces fruit: I am indebted to Mr. Wilson and Dr. Wood for specimens from that locality. Mr. Gibson found it about two miles from Liverpool, on the way to Runcorn; Mr. S. Thompson informs me he has found it at Knot's hole, the Dingle; and adds, that he is also informed on good authority, that it grows on the red sandstone rock in the village of Newton, on the Liverpool and Manchester railway. Mr. Simpson has observed it abundantly on the rocks near Heysham, and in a cave at the head of Morecambe bay.

Merionethshire.—I have seen specimens from near Towyn.

Pembrokeshire.—Mr. Kippist informs me that he observed it abundantly in several places along the cliffs between Tenby and Saundersfoot; and Mr. Lees that he found it in deep fissures of the trap rocks at Fishguard, and in caves and cavities of the old red sandstone near St. Justinian's chapel, St. David's, opposite to Ramsay island, on St. Catherine's island, Tenby, &c.

Somersetshire. — Mr. Grindon informs me that he found it in a cave by the rocky beach near Clevedon, on the 6th of July, 1842. It formerly grew here in great abundance, and also at Portishead.

Sussex.—Ray found this fern about the Castle-rock at Hastings; and I am informed by Mr. Yarrell, Mr. Borrer and Mr. Jenner, that it still exists in the same locality.

Westmoreland. — Mr. Pinder and Mr. Hindson inform me they have found it in this county in a sea-cave near Silverdale.

Yorkshire. — Mr. S. Gibson informs me that it occurs very sparingly on cliffs north of Scarborough.

In Scotland it is of common occurrence, particularly along the eastern coast. The coast of Aberdeen, Fife and Berwickshire may be particularly noticed. On the western coast it is either less abundant, or has not been so frequently noticed. Some years since I observed it growing sparingly in the vertical fissures of the columnar basalt at Staffa, and again more abundantly, and intermixed with *Adiantum-nigrum* and *Ruta-muraria*, on the cathedral at Iona. Except in this instance, I never recollect having seen it established on a building.

In the Isle of Man it has been noticed by Mr. Wilson.

In Ireland its localities are far too numerous to be particularized. In my rambles in that beautiful country I found it on the sea-cliffs whenever I reached the coast: and I believe the Irish botanists have observed it in every county that borders the sea. I must, however, mention one locality that struck me as remarkable: I allude to the lakes of Killarney. As you skirt the upper lake on the way to Kenmare, there is a spot where the rock has been blasted by gunpowder, for the purpose of making a good carriage-way between Turk mountain on the left, and the lake on the right. On this rock the Spleenwort has thoroughly established itself: the plants are of small size and rather remarkable form, and they are not to be procured without considerable difficulty, the face of the rock being steep, and difficult to climb, and the little plants very firmly rooted in the fissures. I succeeded after some trouble in detaching two specimens, the largest of which is represented in the margin. I confess I feel rather gratified in the belief that while it can escape the eye of no botanist who may chance to visit the spot after reading this notice, it will long, by its inaccessible situation, be rescued from extermination. Mr. W. Thompson, whose valuable memoranda I have so often

quoted, informs me that all the forms figured in this work are of common occurrence to the south of Newcastle, county Down.

In the Channel islands it is abundant and luxuriant. Mr. H. Doubleday, in a letter written on his return from spending a few days there, says — "At a lovely spot on the southern coast of Guernsey, called Petit Bot bay, I found a large cave, from the roof of which grew thousands of fronds of *Asplenium marinum;* many of them were two feet, and one thirty inches in length, including the naked part of the stem."

Its European range appears limited to the coasts of France and Spain: it is very luxuriant in Madeira and Teneriffe, and according to Sadler has been found in northern Africa, but I have never heard of its occurrence in other countries.

There is a good figure of this fern in Bolton's 'Filices,'* another in 'English Botany,'† and a third in Hooker's 'Flora Londinensis.'‡

Among botanists of the present day there is no difference of opinion as to its nomenclature: on the continent of Europe it is but little known to botanists, and in this country all our authors agree in calling it *Asplenium marinum.* It should however be remarked, that the different forms of the northern and southern plants, have induced some of our older authors to suppose we have two species. The northern plant is the *Adiantum majus Coriandri folio, Adianto vero affine, pediculo pallide rubente* of Sibbald,§ and also the *Adianto vero affinis minor Scotica folio obtuso saturate viridi* of the same author,‖ as quoted in Ray's 'Synopsis;'¶ and the *Adiantum trapeziforme* of Hudson** and Berkenhout.†† Withering‡‡ properly referred this supposed species to *Asplenium marinum.* The southern plant is the *Chamæfilix marina Anglica* of Bauhin§§ and Ray,‖‖ the *Filicula petræa femina seu Chamæfilix marina Anglica* of Gerarde,¶¶ and the *Asplenium marinum* of Hudson, Berkenhout, and all modern botanists.

* Bolt. Fil. tab. 15. † Eng. Bot. 392. ‡ Flor. Lond. t. 60.
§ Sibb. Scot. 7. ‖ Id. 8. ¶ Syn. 124. ** Flora Anglica, ii. 460.
†† Berk. Syn. ii. 309. ‡‡ Arr. Brit. Pl. iii. 769. §§ Bauhin, iii. 2, 737.
‖‖ Syn. 119. ¶¶ Ger. Em. 1143.

Ray recommends this fern as a medicine in cases of obstruction, and also informs us that the mucilage extracted from it, when applied externally, is recommended for burns when all other applications have failed.*

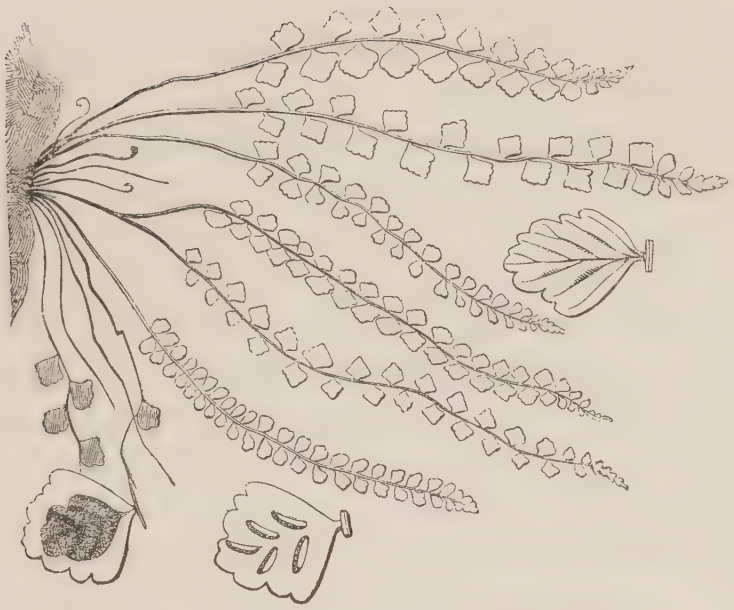
The roots of *Asplenium marinum* are black, wiry, tough, long, and so firmly fixed in the crevices of rock, that it cannot be eradicated without considerable trouble: the rhizoma is tufted, black, and covered with bristly scales: the fronds make their appearance in June and July, ripen their seed in October and November, and remain perfectly green throughout the year. In August the fronds of two seasons are equally vigorous, the younger ones being distinguished by their paler colour and immature fructification.

The frond is linear and simply pinnate, the pinnæ are stalked and serrated; their forms are various, as will be seen by the figures, two larger than the rest frequently appear near the apex: the pinnæ are connected by a narrow wing running along the rachis, as shown at *d*, page 276. The lateral veins are forked almost immediately after leaving the midvein; the anterior branch bears a long linear cluster of bright rust-coloured capsules; this, when young, is covered by a white membranous involucre, of similar form, which always opens towards the apex of the frond.

It is a most difficult fern to deal with in cultivation, unless carefully protected from exposure: it will thrive luxuriantly in a stove-house, with a moist heat of 70° Fahr., but dies on rockwork, even in the purest air, if denied the advantage of the sea-breeze; this is the more remarkable, since at Newton, Warrington, and Killarney, as recorded in the preceding pages, it has voluntarily forsaken the vicinity of the sea.

It may be here observed that the present species, together with *Aspl. viride* and *Aspl. Trichomanes*, form another natural group, distinguished by the elongate and simply pinnate frond, by a great uniformity in the character of the pinnæ, and by a similarity in the venation.

* Hujus usus est in obstructionibus viscerum. Extrinsecus commendatur ad ambusta [extracta mucilago] ubi reliqua omnia medicamenta auxilium negant.—Syn. 119.



GREEN SPLEENWORT, (*half the natural size*).

ASPLENIUM VIRIDE, Hudson.

THIS is a beautiful little fern, delighting in wild hilly countries, especially if abounding in waterfalls, and shunning the vicinity of man. It is found rooted firmly in the fissures of rocks; when sheltered, growing to a length of eight or ten inches, but when exposed, seldom measuring more than two. The following list of localities will show its range in England and Wales.

BRECKNOCKSHIRE. — Mr. Ralfs informs me he has found it near Brecon, on Brecon-beacon, and on Trecastle-beacon: Mr. Westcombe gives me Chapel-y-Fin as a habitat: Mr. Lees observed it at the waterfall of Scwyd-yr-Henryd near Capel Colbren, on the rocks below the fall, on the right hand side, where there is also a very old trunk of mountain-ash covered with a drapery of this fern.

CAERNARVONSHIRE.—I have found it in abundance near Llyn-y-Cwn, Twll-du, &c.

CHESHIRE. — "Among stones and rubbish thrown out of the quarries at Carr-edge, Mr. Bradbury."—*Botanist's Guide.*

CUMBERLAND.—Mr. Winch gives Ashness gill, Borrow force,

and rocks at Gillsland as localities, at the latter station it is very abundant.

Durham.—Mr. Watson and several other botanists have given me Falcon clints as a locality.

Derbyshire.—Mr. Pinder informs me it is remarkably abundant and luxuriant in Cavedale, Castleton; and Dr. Wood that it is abundant near Buxton. I am indebted to Mr. Pinder for a liberal supply of specimens.

Glamorganshire.—Mr. Dillwyn has found it in crevices of the rocks at the upper Cilhepste waterfall, near Pont Nedd Vechn, and at Darran yr Ogof, near Ystradgunlais.* Mr. Babington informs me he found it at Merthyr Tydfil.

Lancashire.—Mr. Sidebotham informs me it grows at Dulesgate, and it is said to have been found in the quarries at Staley, but he has not seen it from the latter locality.

Leicestershire.—"A few plants were found in the crevices of the crags on Charley forest, at Beacon-hill: Pulteney."—*Botanist's Guide.* The Rev. A. Bloxam, to whom I am indebted for a list of Leicestershire ferns, does not mention this species.

Merionethshire.—I observed it sparingly on Cader Idris.

Northumberland.—Mr. Winch found this fern sparingly on rocks by the Irthing at Wardrew.

Westmoreland.—Mr. Pinder has favored me with specimens from Hutton-roof, Farlton and Arnside. Mr. Hindson informs me it is found on Casterton fell; and Mr. Watson, on the authority of Mr. Bowman, informs me that it has been found at Mazebeck scar.

Worcestershire.—On Ham-bridge: first observed there by Mr. Stretch of Worcester; the station afterwards verified by Mr. Lees† and Mr. Westcombe.‡ I had long noted Ham-bridge as a locality worthy of a visit on account of its producing this fern, and resolved to make it an object of pilgrimage. In May last I wended my way from Sapey brook, along the rich valley of the Teme, through meadows clothed with luxuriant herbage, and among cattle fit for a Smithfield show. As I approached the bridge, the red bricks of which it is built, and the dry and

* Phytologist, 183. † Id. 46. ‡ Id. 513.

dusty road which passed over it, seemed in no degree to increase the chance of success: yet on that bridge, facing the road-way and covered with dust, was the identical plant I sought — small indeed, but the species not to be mistaken.*

YORKSHIRE.—Mr. Tatham, who informs me it is very common on the limestone cliffs above the town of Settle, has kindly supplied me with specimens. It has also been found near Halifax, Ais-la-beck, Richmond, Gordale, Gilla-leys wood, and other localities too numerous to mention.

In the Highlands of Scotland *Asplenium viride* is a fern of common occurrence. I should not call it an abundant fern, but it is almost impossible to wander amongst the mountains without frequently noticing it: a few counties are given below.

ARGYLESHIRE.—I observed it in several localities.

DUMBARTONSHIRE.—Mr. Gourlie has found it on Ben Voirlich.

LANARKSHIRE.—I observed it growing by the Falls of Clyde; and Dr. Balfour, Mr. Gourlie, and other Scotch botanists appear to be well acquainted with this station.

NAIRNSHIRE. — Mr. Stables informs me that it is of common occurrence in congenial situations in this county.

PERTHSHIRE. — Mr. Gourlie and several other botanists have found it on Ben Lawers.

ROSSHIRE.—The Rev. G. Gordon has observed it in Rosshire.

SUTHERLANDSHIRE.—Mr. Watson has observed it in this county.

In Ireland this fern appears to be much less common than in Scotland or the North of England.

CORK.—Dr. Taylor has found it near Bandon in this county.

DONEGAL. — Mr. W. Thompson informs me it was found by Mr. E. Murphy near Lough Eask.

KERRY. — Mr. Mackay and several other botanists give Turk mountain, by the Lakes of Killarney, as a locality.

SLIGO. — Mr. W. Thompson and several other botanists have found it on Ben Bulben.

Asplenium viride is found in all the countries of Europe, but I have not heard of its occurrence beyond the limits of that continent.

* Phytologist, 671.

The root is fibrous, black, and rather tender, the rhizoma black, scaly and tufted; the fronds appear in May and June, arrive at maturity in August, and remain green through the winter: they are fertile only. The stem is naked for about a third of its length: half the naked portion is black or purplish; the remainder to the apex of the frond is of a vivid green: the frond is narrow, long, linear, and simply pinnate; the pinnæ are not so numerous as in *Trichomanes*, they are quadrate, but without angles, and are more or less crenate at the margin; they are for the most part placed alternately, and are generally very distinct and distant, but I have seen them crowded, as, for instance, in the plants from Ham-bridge: they are attached to the rachis by their stalks only. The lateral veins are either simple or forked; they bear a long, linear cluster of capsules, and when forked, the division almost invariably takes place beyond the capsules: this appears to me a very excellent diagnostic, and one by which this species may readily be known from *Trichomanes*: some of the veins reach the margin of the pinna. The capsules are at first covered by a long white involucre, which soon disappears, and they become a bright ferruginous confluent mass, occupying the middle of the pinna, and concealing its midvein. The clusters, before their union, are usually six in number.

Mr. Gibson of Hebden-bridge has specimens of this plant which have the pinnæ very long and pointed: I am indebted to Mr. Gibson for a sight of this variety, which he proposes to call *acutifolium*.

There are good figures of this fern in Sowerby's 'English Botany,'* and in Schkuhr.†

We are indebted to our countryman Hudson for first describing this fern with a specific name.‡ It is described by Llwyd as a species in Ray's Synopsis, under the name of *Trichomanes ramosum*; § but Linneus, notwithstanding its diagnostics are there clearly pointed out, makes it a variety of *Aspl. Trichomanes*, under the name of *Asplenium Trichomanes ramosum*. ‖ Hudson's name has been adopted by all subsequent authors.

* Eng. Bot. 2257. † Schkuhr, tab. 73.

‡ Asplenium viride frondibus pinnatis: pinnis subrotundis crenatis basi truncatis.—Flora Anglica, ii. 453.

§ Syn. 119. ‖ Sp. Plant. 1541.

COMMON SPLEENWORT, (*half the natural size*).

ASPLENIUM TRICHOMANES, Linneus.

THIS plant occurs so generally throughout England, Wales, Scotland and Ireland, that I do not feel myself justified in printing a list of localities; it grows on rocks, walls, churches, ruins, bridges, and sometimes, but less frequently, on banks and in hedge-rows. In the eastern counties it is much less common than in the western: in Essex, Norfolk and Suffolk it may be considered rare, but it occurs in all these counties. I am indebted to Mr. G. S. Gibson for a specimen from Hadstock church, and to Mr. R. Jacob for another from Stortford, both in Essex. In the west of England, and especially in Wales, it is a common fern. I once saw it in the valley of the Wye, growing in such profusion on a little bridge near the town of Bualt, that it formed a continuous covering of green, and presented a very beautiful appearance. There is scarcely anything in the vegetable world more beautiful than such a scene as this; and it is only known by those who have tried the experiment, how readily such a scene may be transferred to a garden.

This beautiful little fern is found in every country of Europe,

in Africa, and in the United States of North America, where it has been called *melanocaulon* and *Trichomanoides;* but after a careful comparison I am unable to detect the slightest difference between the North-American and British plants.

There are good figures of this fern in Gerarde,* Bolton,† 'English Botany,'‡ Hooker's 'Flora Londinensis,'§ and in many of the continental Floras.

Concerning the name little difference of opinion has prevailed. Berkenhout,‖ and one or two others, have called it *Trichomanoides*, but nearly all authors have described it as *Asplenium Trichomanes.*

Its medicinal properties were much celebrated by the older botanists. Ray¶ says it is useful in complaints of the chest and lungs; and Lightfoot informs us that in Scotland the country people sometimes give a tea or syrup of it for coughs and other complaints of the thorax, but that it is rarely sold in the shops.**

The roots are black and wiry: they insinuate themselves into the fissures of rocks previously so small as to escape observation. In old buildings this fern certainly promotes decay, by disintegrating the mortar, which, however enfeebled by time, still adds in some degree to their strength and durability. The fronds make their appearance in April and May, arrive at maturity in August and September, and remain perfectly green throughout the winter. The stem is naked for a third part of its length, smooth, shining, and, throughout its whole length, of a purplish black colour. The frond is narrow, linear, and simply pinnate; the pinnæ are dark green and very numerous, irregularly ovate, obtuse at the apex and more or less crenate at the margin; they are usually distinct and distant, but sometimes crowded, and each more or less recumbent on the one preceding it: they are attached to the stem by their stalk only, and when the frond approaches decay, the pinnæ fall off like the leaves of phænogamous plants, leaving the stems naked, which, being very durable, last from year to year, and become a dense tuft of denuded bristles. The pinnules vary from the size of those re-

* Ger. Em. 1146. † Bolt. Fil. tab. 13. ‡ Eng. Bot. 576.
§ Flor. Lond. 156. ‖ Berk. Syn. ii. 305. ¶ Ray, Syn. 119.
** Lightfoot, Flor. Scot. ii. 663.

presented at page 285, to that of the detached ones in the same figure, intended to illustrate the fructification. The lateral veins are forked soon after leaving the midvein (see fig. *a*), the anterior branch bearing a linear cluster of capsules almost immediately after the division; this cluster is at first covered by a long, linear, white, membranous involucre, (see fig. *b*): as the capsules swell this becomes obliterated, and the clusters, which are dark brown, become nearly confluent in two series (see fig. *c*), which however very rarely unite over the midrib: the clusters are ten or twelve in number.

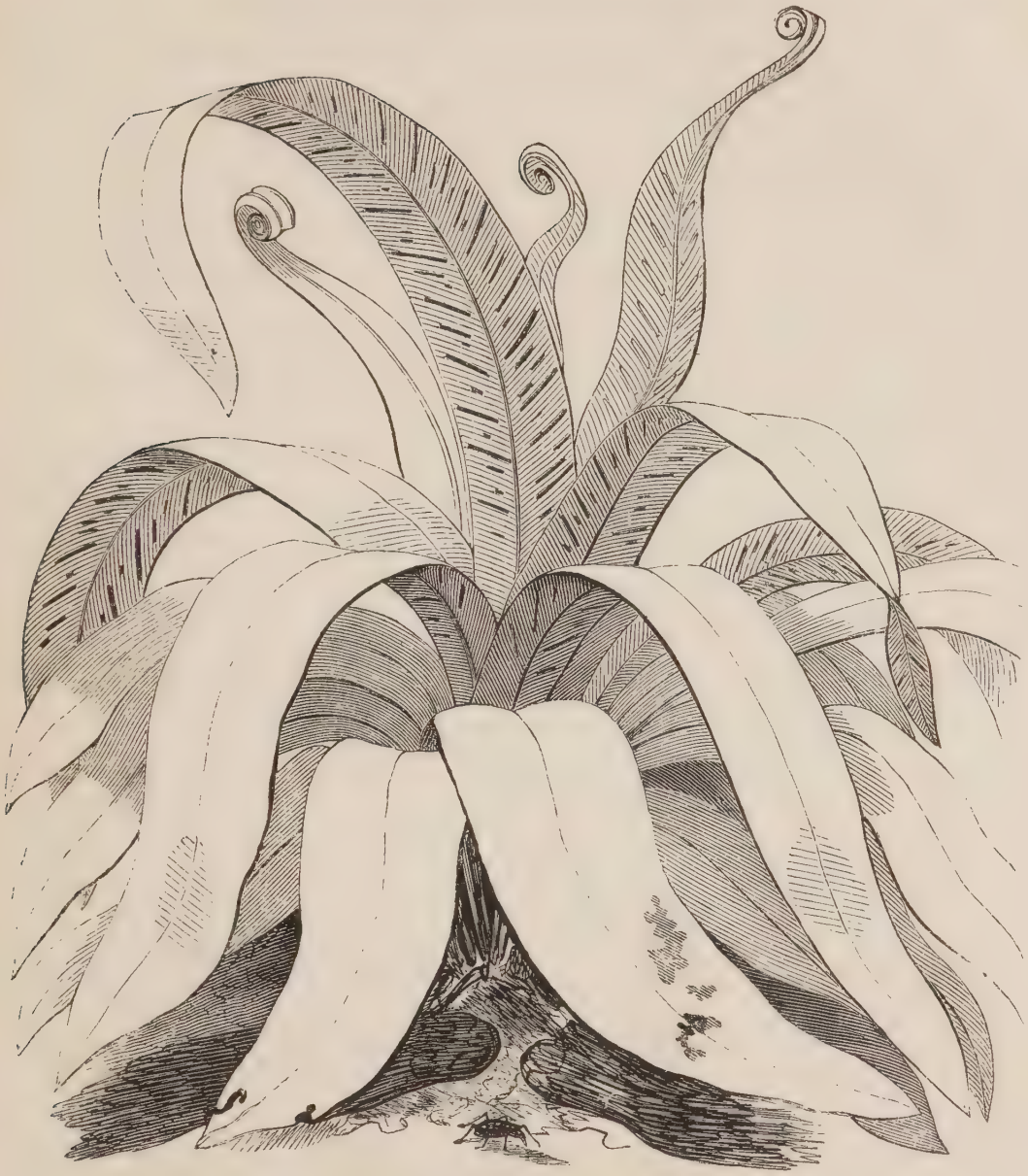
This fern is, generally speaking, constant in its form, and rather remarkable for its uniformity of appearance. I have, however, received a marked variety from Mr. Gibson of Hebden-bridge. The pinnæ, instead of being nearly entire, as is usually the case, are deeply pinnatifid, as represented in the accompanying figure, and the pinnules or lobes are irregularly dentate. The specimens sent by Mr. Gibson are perfectly without fructification, but I do not know whether this is to be considered a character of the variety, or incidental only to the fronds I have received. The right-hand figure is a fac-simile representation of one frond as regards form and size; the left-hand figure represents a portion of a frond, in which the divisions are still more irregular.

This beautiful variety appears to have been known to our earliest botanists, two previous figures existing in their works; neither of them, however, represents the fronds quite so deeply divided as in the present instance. One figure is in Plukenet's 'Phytographia,'* the plant being described in that author's 'Almagestum Botanicum'† as *Adiantum maritimum, segmentis rotundioribus:*' it is stated, on the authority of Sherard, to have been found in Jersey. The second figure is in plate 315 of

* Pluk. Phyt. tab. 73, fig. 6. † Pluk. Alm. Bot. 9.

Tournefort's 'Institutiones Rei Herbariæ;' it is also noticed in Dillenius' edition of Ray's 'Synopsis,' and by Smith, in the 'English Flora,' where it constitutes the variety β. of *Asplenium Trichomanes*. The variety γ. of Smith, to which that author quotes Sir Robert Sibbald's description, appears to have little resemblance to the variety, or even species in question, if I may venture to judge from Sibbald's plate 3, figure 4, to which Smith refers; but as to the correctness of the reference, I am unable to speak, for Sibbald himself has, in no way that I can discover, connected the text and figure.

Mr. Gibson's plant was gathered at Kant-clough, four miles from Burnley, in Lancashire: it was originally discovered there in 1832, and some plants taken up at that date and planted in a garden at Halifax, have been found to retain their remarkable character in cultivation. A very similar variety has been found in Devonshire by the Rev. W. S. Hore, who has kindly sent me a specimen.



HART'S TONGUE SPLEENWORT (*one-eighth natural size*).

SCOLOPENDRIUM VULGARE, Symons.

THE Hart's Tongue is a particularly handsome and ornamental fern: its habit is well marked, and very decidedly different from every other British species. I believe it is universally, although not abundantly distributed: it so frequently grows in the thickest part of hedges that it may readily escape observation, and thus does not appear so abundant as it really is. In Scotland I found it sparingly distributed, but I never passed a day without recognizing it in some few localities. In Ireland it is much

more abundant; it is not only scattered generally over the island, but occurs in some localities in very great abundance, particularly in the neighbourhood of Sligo, and in the demesne of Muckruss, near Killarney; it here grows among the underwood, in the shrubberies, &c. in large luxuriant tufts, the fronds radiating from a common centre, and each being gracefully arched in a semicircle, like the long feathers of a cock's tail. The Hart's Tongue is very commonly found on walls and ruins; and it seems particularly to delight in old wells, in which last situation its fronds sometimes grow to a very large size.

I believe this handsome species is found in every country throughout Europe, but is very sparingly distributed towards the north. It has also been found in the United States, but is there considered one of the rarest of ferns. I know nothing of it in Africa, Asia, or South America.

It is almost impossible to fail in giving an intelligible representation of so marked a species. All the British and continental figures sufficiently exhibit its very distinctive form.

This fern is the *Phyllitis* of Ray,* and all the older authors. Linneus made it an *Asplenium*,† giving it the specific name of *Scolopendrium*, in which he was followed by Hudson,‡ Berkenhout,§ Withering,‖ and Hoffmann.¶ Sir J. E. Smith, in the 'Turin Transactions,'** separated it from *Asplenium* as a new genus, to which he gave the name of *Scolopendrium*: in this genus he included *Ceterach*. The present plant was described by Symons,†† as *Scolopendrium vulgare*, a name adopted by Smith, Hooker, Francis and Babington: on the continent, Swartz§§ adopted Smith's genus, but gave it the specific name of *officinarum*: in this he was followed by Willdenow and Weber and Mohr. It is the *Scolopendrium Phyllitis* of Roth,‖‖ and the *Scolopendrium officinale* of the 'Flore Française.'¶¶ From this statement, which I have endeavoured to compress into the smallest possible compass, I think it will appear that there is no *generally adopted* name for this species, and that the Bri-

* Syn. 116. † Sp. Plant. 1537. ‡ Flora Anglica, ii. 452.
§ Berk. Syn. ii. 305. ‖ Arr. Brit. Pl. iii. 766. ¶ Hoff. Deuts. Flor. ii. 13.
** Act. Taur. v. 410. †† Sym. Syn. 193. §§ Syn. Fil. 89.
‖‖ Roth, Flor. Germ. iii. 47. ¶¶ Flor. Franc. ii. 552.

tish is totally different from the continental nomenclature. I am quite at a loss to understand the genus *Scolopendrium*, as established by Smith for two species so totally dissimilar that they may be said to possess little in common but the name of Hart's Tongue; and I consider it a usage of very questionable propriety to convert an established specific into a generic name. It appears to me that the present species, together with the Portuguese *Hemionitis*, constitute a natural division of the great Linnean group *Asplenium*, which still requires a generic appellation: in this case the original and well-known term *Phyllitis* might with propriety be employed, but an invincible dislike to the introduction of names, leads me for the present to adopt Smith's nomenclature, protesting, however, against his group *Scolopendrium*, both as unnatural and ill-named.

We learn from the herbalists that this plant was much in vogue as a medicine. Ray speaks of it favourably as an astringent, and of its healing powers, applied as an ointment to wounds and ulcers.* Lightfoot says it is used by the country people in Scotland, as a vulnerary for burns and scalds: † and we learn from the 'Flore Française' that it is used in France as an astringent in cases of diarrhœa and hæmorrhage.‡

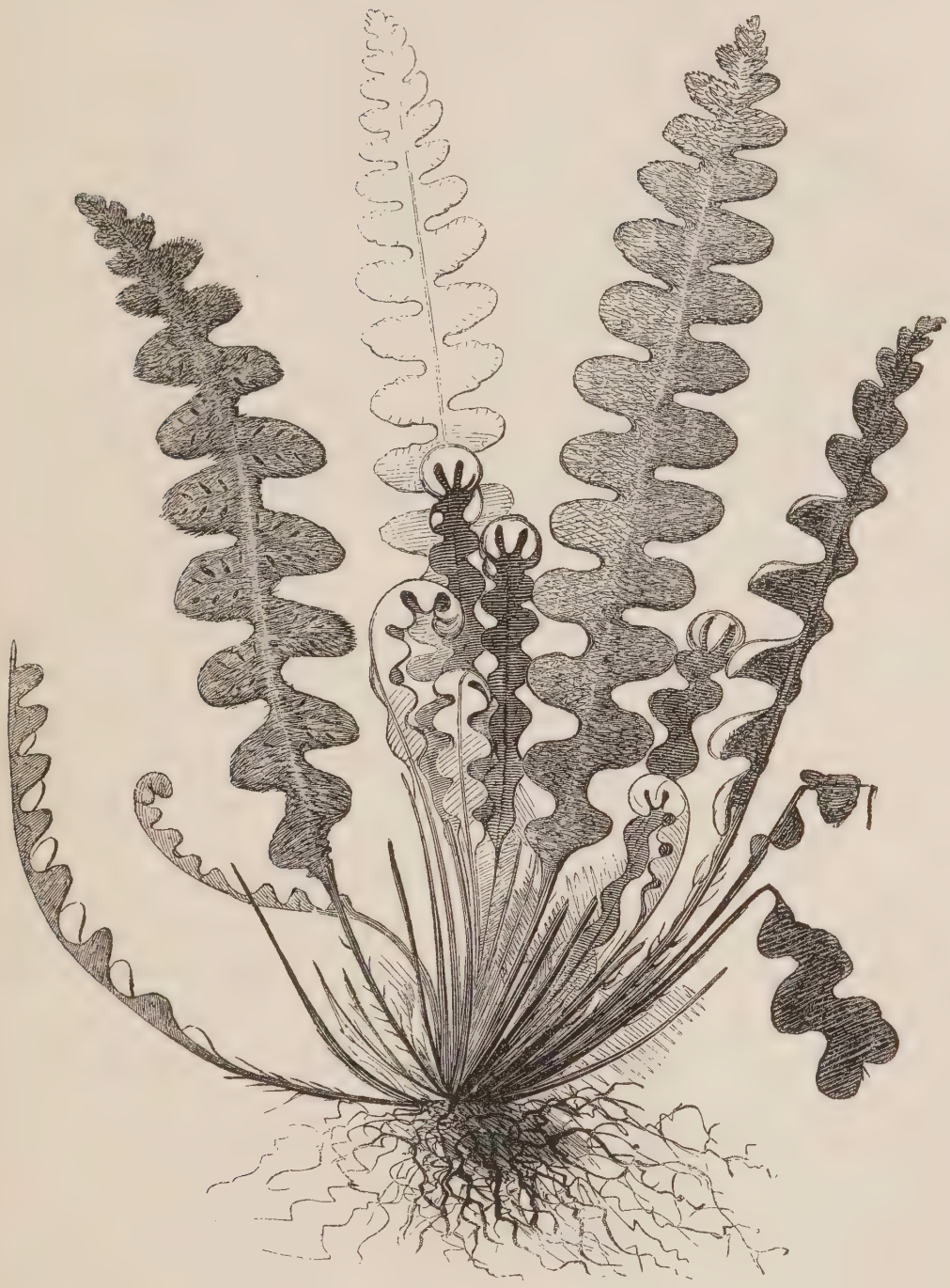
The roots are black, stout, and very long and strong: the rhizoma is tufted, blackish, scaly, and almost spherical: the young fronds make their appearance in April, growing in an erect position, the apex remaining circinate; by degrees they become horizontal, and at last pendulous; they arrive at maturity by the end of Septem-

* Syn. 117. † Lightfoot, Flor. Scot. 661. ‡ Flor. Fran. ii. 552.

ber, and continue in full vigour throughout the winter, and until those of the ensuing year make their appearance.

The form of the frond is elongate, linear, and quite undivided, acute at the apex and cordate at the base. The naked portion of the stem varies from a tenth to about a third of the entire length of the frond; it is of a dark purple colour, and rather scaly at the base: in some specimens, but these are generally young, the entire plant is hirsute, in others perfectly glabrous. The seedling plants put on a variety of forms; a few of them are shown at the top of the cut in the preceding page.

The veins proceed directly from the stem, and each has four or five branches: to the outside branches of each vein, or set of veins, is attached a long line of capsules, covered by a white membranous involucre of the same form. Owing to this disposition of the capsules on the outer branch, the masses are invariably in pairs; the two involucres at first touch, and appear as one; a day or two later a line appears between them, showing that they are divided; the line gradually becomes more apparent as the capsules increase in size; at last, the two involucres are pushed back from each other, and finally disappear. The veins and attachment of capsules are shown on the *upper* side of the figure; the involucres and clusters on the *lower* side: the earliest stage of the double line and its involucres is shown to the left hand, and each successive figure towards the right shows a gradual advance to maturity.



SCALY SPLEENWORT, (*natural size*).

CETERACH OFFICINARUM, Willdenow, Hooker, Babington.

Scolopendrium Ceterach, Smith.

THIS interesting little fern seems very generally although sparingly scattered over the northern, western and southern counties

of England, making its appearance on ruins, churches and old walls. In the midland counties it is of rare occurrence, and in the eastern is scarcely known. In a few instances it is found on rocks, which must be considered its native habitat; and I have particularly to acknowledge my obligation to those botanists who have noticed this and other interesting particulars connected with its choice of situation. From the great number of communications received I am compelled to omit many notices that I would gladly have published. I have however made my selection so as to embrace the principal facts as regards its geographical range. In England, Westmoreland, Somerset and Gloucester appear to be counties in which it occurs most abundantly.

Anglesea.—It is noticed in the 'Welsh Botanology' as having been found on Holyhead mountain.

Berkshire.—I have observed it on the walls at Pusey.

Brecknockshire.—Mr. Ralfs observed it sparingly at Brecon; and Mr. Murcott on the bridge at Brecon, on an old wall near the ruins of the Priory, on a wall at Talgarth, plentifully upon a bridge two miles from Brecon on the Tal-y-bont road, on a wall near Mr. Bailey's castle, between Tal-y-bont and Crickhowel, and on the bridge and old walls at Crickhowel.

Caernarvonshire. — I observed it sparingly on walls and rocks near Bangor, and very luxuriantly on a bridge two miles from Caernarvon, on the road to Pwllehi. Mr. Wilson noticed it at Treborth.

Carmarthenshire. — Mr. Dillwyn says it is of frequent occurrence in this county.

Cheshire. — "Old walls at Carr-edge, going to the stone-quarries: Mr. Bradbury."—*Botanist's Guide.*

Cornwall.—Mr. Ralfs gives me Calstock by the Tamar as a locality, on the authority of the Rev. H. Pinnock; and Miss Warren has observed it at Pentillie-castle, Trevenna-house, Newlyn, Truro, &c.

Cumberland. — Mr. Pinder has observed it at Sandwith and St. Bees; and Mr. Heysham informs me it has been found at Yew-crags and Airey-beck, in Gowbarrow-park, Ulswater.

Denbighshire. — "Rare: Mr. J. E. Bowman."—*Francis's Anaylsis.*

Derbyshire.—On the rocks in Dovedale it has been observed by Mr. Pinder and many other correspondents. "On limestone rocks in Lath-hill-dale: Mr. J. E. Bowman. On a wall at Newton near Melbourne: Rev. A. Bloxam."—*Francis's Analysis.*

Devonshire. — Miss Griffiths informs me it is common upon rocks and walls near Torquay, and that it occurs on Rentisbury church, North Devon: Mr. Beynon also mentions its growing luxuriantly on rocks at Torquay, intermixed with *Asplenium Trichomanes* and *Ruta-muraria.* The Rev. W. S. Hore observes that it is not uncommon on walls built of limestone, but is rare on slate; Mr. Sparkes observed it on rocks at Babbicombe; Mr. Watson near Plymouth; Mr. Jordan at Chudleigh; Mr. Forster on a wall between Totness and Newton-Bushell.

Dorsetshire.—I have occasionally seen this fern on old walls about Sherborne &c., but consider it far from common.

Glamorganshire. — Mr. Lees informs me it occurs on rocks of carboniferous limestone opposite the Mumbles; Mr. Westcombe that he has found it on Pennard-castle, and on walls in Gower. Mr. Dillwyn finds it commonly about Swansea; and Mr. Murcott on a wall at Aberdare, on a bridge near Aberdare, and on the walls of Caerphilly castle.

Gloucestershire.—I have observed this fern to be unusually common in this county, having noticed it in many and distant localities, as near Bristol, Cheltenham, Tewkesbury, Painswick, Cirencester, &c. Mr. Lees has noticed it on Deerhurst-church near Tewkesbury, and sparingly on walls among the Cotswolds, on iron-stone rocks at Cherewell in the Forest of Dean, and profusely clothing almost every old wall about that place; equally abundant on the loose stone walls near Chepstow, on the Gloucestershire side of the river Wye: Mr. Lees observes that it is peculiarly partial to the carboniferous limestone district. Miss Browne has observed it in abundance at Clearwell near Coleford; Mr. Flower on old walls at Stapleton, Bristol and Wick; Mr. Babington, Mr. Thwaites and Mr. Grindon say it is plentiful on St. Vincent's rocks.

Hampshire. — I have observed it on the walls of Winchester cathedral. Mr. Flower has noticed it at Netley-abbey, Southampton, and the New Forest: Mr. Reeves on the walls of the

garden belonging to the house in which Mr. Cobbett formerly resided, at Bottley: Dr. Bromfield in the Isle of Wight, on the south front of Brading-church, sparingly; upon a low wall at Cooper's near Bembridge, abundantly; on Carisbrooke-castle walls, sparingly. "On the tower of Alresford-church: Mr. Forder."—*Francis's Analysis.*

Herefordshire. — In the town of Leominster I used to find it very commonly; it is extremely abundant on the wall of Mr. Bedford's garden, in the middle of the town, and still exists on Eton bridge, in the Grange, and in several of the streets; it occurs at Hereford and near Ross: Mr. Lees informs me it is extremely abundant on the walls of mill-stone grit at Whitchurch, between the village and the banks of the Wye, towards the limestone quarries.

Kent. — Mr. H. L. Jenner finds it on walls at Riverhead; and I have seen specimens from near Tunbridge-wells, and from Maidstone, Swanscombe and Shorne churches. "On Chiselhurst, Lenham and Stroud churches: Martyn. Wall at the entrance into Ewell church-yard: Dillwyn." — *Botanist's Guide.*

Lancashire. — Mr. Wilson informs me it grows near Kellet, north of Manchester, and near West Houghton; Mr. S. Thompson that a single plant was found at Club-moss, three miles from Liverpool; Mr. Simpson, that it occurs near Lancaster; Mr. Hindson, that he has observed it on walls at Burrow.

Middlesex.—"On the wall at Brook-house, Hackney: Martyn."—*Botanist's Guide.*

Monmouth.—I found it tolerably abundant in this county: it occurs on Tintern-abbey and other ruins. Mr. Lees observed it on Welch Bignor church and walls, and thence southward abundantly on the rocks and walls near the Wye, especially about Chepstow: Mr. Murcott, on the road between Chepstow and Coleford, and Mr. Bladon in the vicinity of Pont-y-pool.

Norfolk.—Mr. S. P. Woodward informs me that Miss Rackham observed it on the buttresses of Heveringham-church, near Norwich, in 1841. "On the tower of Heydon-church: Rev. H. Briant."—*Botanist's Guide.*

Nottinghamshire.—Mr. Sidebotham informs me he found it on Colwick park-wall.

Oxfordshire. — "Old wall near Cowley: Mr. Baxter." — *Francis's Analysis.*

Pembrokeshire. — Mr. Kippist informs me he found it plentifully on stone walls near Tenby, on the road to Gumpeston; and Mr. Lees on the castles of Pembroke and Manorbeer, and on Haverfordwest priory, and most profusely on walls at Penally near Tenby: it should be observed that Dr. Richardson, in Ray's 'Synopsis,' notices its abundant occurrence in this county.

Shropshire. — Mr. Westcott has observed it on the walls of Ludlow-castle, and in several other localities near Ludlow.

Somersetshire. — Mr. Thwaites, through whose kindness in sending me living plants I have been enabled to make my observations on the fructification, informs me it is abundant upon rocks in Leigh woods, and common on walls in the vicinity of Bristol. Mr. E. J. Quekett says it is abundant upon limestone walls, generally occupying the top of the wall while the bottom is wet; Mr. Lees has found it on the rocks of carboniferous limestone at Bream down: Mr. Grindon on walls at Ashton, Tickenham and Clevedon; at the last-named place Miss Browne informs me it is abundant: Mr. J. Harris and many others have seen it on Cheddar cliffs; and Mr. Flower remarks that it is commonly distributed throughout the county on rocks and old walls.

Staffordshire.—Mr. Garner, in his lately published work on the Natural History of the county, gives the following localities: Wetton, Glutton, Berresford, Beeston-tor, Dovedale.

Sussex. — Mr. E. Jenner informs me it is not common in the eastern division of the county, Rose-hill, Brightling and Chailey being the only localities he has noticed; in the western division Mr. Borrer has given me Goodwood park-wall, Pulborough church, Washington, Edburton, Enfield and Hurst Pierpoint, as localities; and Mr. E. Jenner, to whom I am indebted for specimens, has added Stopham, Funtington and Marden.

Warwickshire.—Mr. Perry and Mr. Murcott inform me that it grows upon a brick wall at the back of the mansion house at Tachebrook.

Westmoreland. — Mr. Simpson informs me that this fern is very abundant on a wall near the junction of this county with Lancashire: Miss Beever that it is most abundant on Arnside-

knot, growing in large masses among the stones and on the rocks, also on a wall about a mile from Milnthorpe, on the road to Holme, and less abundantly on a wall near Brathay-bridge: Mr. S. Thompson that it grows on Scout's scar near Kendal, at Crosby, and on Kendal-castle: Mr. Pinder, that he found it on the rocks and screes in the greatest profusion, and growing in dense masses: and Mr. Hindson, that it occurs on a wall near Casterton: Mr. Ainly and several other botanists have noticed its occurrence in this county. "In limestone fissures on the highest part of Kendal-fell: Mr. Gough. Troutbeck: Mr. Woodward. Ambleside: Rev. J. Dodd."—*Botanist's Guide.*

Wiltshire.—Mr. Babington informs me it is of frequent occurrence in this county near Bath, and Mr. Flower that it occurs on rocks and walls throughout the county, but not frequently.

Worcestershire. — I have observed it upon the church at Malvern: Mr. Lees says it occurs sparingly on walls at Great Malvern, and Mr. Westcombe at Badsey near Evesham, and in Wych-wood forest.

Yorkshire.—Dr. Richardson, in Ray's 'Synopsis,' observes that it occurs in some abundance above Malham-tarn: and Mr. Tatham informs me it still grows here, although sparingly. Mr. Gibson mentions the old walls of Kirklees-park, near Halifax, as a second locality.

In Scotland the fern is of great rarity; the following localities have been handed me by correspondents.

Argyleshire. — Mr. Gourlie informs me it has been found sparingly at Kilfinnan.

Perthshire. — Mr. Gourlie has found it on Kinnoul-hill. Lightfoot had previously recorded this locality in the 'Flora Scotica.'

Renfrewshire. — Mr. Gourlie states that Dr. A. K. Young has observed it near Paisley.

In Ireland, particularly in the West and South, the Scaly Spleenwort is a fern of common occurrence, and grows to a large size.

Antrim.— Mr. W. Thompson informs me that in the late Mr. Templeton's MSS. it is recorded as growing on old walls at Galgorm, and on walls of the deer-park at Cave hill.

Clare. — Mr. W. Thompson says it is common on the limestone in this county; and I observed it in many localities, particularly in the vicinity of Castle-Connel.

Cork. — I observed it most abundantly in many parts of this county: *Ceterach*, *Adiantum-nigrum*, *Ruta-muraria*, *Trichomanes* and *Scolopendrium* half cover many of the walls about Cork and Fermoy.

Down. — From Mr. W. Thompson I learn that it occurs at Bryansford.

Fermanagh.—Mr. W. Thompson informs me that the Hon. J. L. Cole observed it at Florence-court in this county.

Galway. — Mr. W. Thompson observes it is common on the limestone in this county. In many parts of the county I observed it in the greatest possible luxuriance. In and about the little town of Oughterard I was much struck by its beautiful appearance, intermixed with *Cotyledon Umbilicus*, there also gigantic, nearly covering many of the humble dwellings.

Kerry. — I observed it upon rocks and walls in many places round Killarney.

Kilkenny. — Mr. Mackay observes that it is abundant at the marble-quarries at Kilkenny.

Limerick.—I saw it in many places near the town of Limerick.

Waterford.—I saw Ceterach in many parts of this county: it occurs here and there on nearly all the walls between Clonmel and Waterford.

Wicklow. — I observed this fern on several of the old buildings at Glendalough.

The Scaly Spleenwort is found in all the middle and southern countries of Europe, but I believe it has not yet been observed in Lapland, Norway, Sweden, or the North of Russia: it is common in the North of Africa, in the Canary and Cape de Verd Islands. In Madeira and Teneriffe there is a plant of much larger size than ours, and of more beautiful appearance; I cannot take on myself to say whether the two forms are identical as species.

Very intelligible figures of this fern are given in Schkuhr,*

* Sckhuhr, tab. 7.

Sowerby's 'English Botany,'* and Gerarde's Herbal.† Those in Bolton‡ and many other works would not be recognized.

This fern is the *Ceterach*, Spleenwort or Miltwast of Gerarde,§ the *Ceterach officinarum* of Bauhin's 'Pinax,'‖ and the *Asplenium sive Ceterach* of Ray¶ and others. Linneus made it an *Asplenium*,** and subsequent authors have differed much as to its nomenclature.

Its medicinal properties were formerly supposed of great value, but like those of its congeners, they have greatly fallen into disrepute: it was once supposed very efficacious applied externally to wounds and ulcers. It has, moreover, other *vertues* as they were called, in addition to its medicinal ones, some of these are enumerated by Gerarde, but they appear so very like *vices*, that I decline transferring them to these pages. Gerarde himself, after dwelling on one of them with great apparent zest, adds, "But this is to be reckoned among the old wives' fables, and that also which Dioscorides tells of, touching the gathering of Spleenwort in the night, and other most vain things which are found here and there scattered in old books: from which most of the later writers do not abstaine who many times fill up their pages with lies and frivolous toyes, and by so doing do not a little deceive yong students."†† Pleasant herbalist! I fear I should neglect thy sage advice, could I but find a plea for introducing thy Bernacle goose-tree amongst the British Ferns.

The roots of the Scaly Spleenwort are short, but possess a remarkable power of penetrating mortar, however hard it may be: they also find their way into rocks which appear to present the most compact surface: still from the luxuriance of some plants lately sent me by Mr. Thwaites, it would appear that this species thrives much more vigorously in the rich vegetable mould which has been accumulating during centuries in the deeper fissures: here the roots are longer, but still appear short as compared with those of *Trichomanes* and other rock-loving species. The rhizoma is tufted, brown and scaly. The young fronds

* Eng. Bot. 1244. † Ger. Em. 1140.
‡ Bolt. Fil. tab. 7. § Ger. Em. 1141. ‖ C. B. Pinax, 354.
¶ Syn. 118. ** Sp. Pl. 1537. †† Ger. Em. 1141.

make their appearance in May, arrive at maturity in autumn, and continue green and vigorous throughout the winter: they are always fertile. A small portion of the stem is naked, but beset more or less thickly with pointed scales: the form of the frond is linear, slightly attenuated below, and deeply pinnatifid; the segments are short, rounded, and sometimes crenate or lobed, their position as regards the stem is rather oblique; their entire under surface is densely clothed with brown, pointed, imbricated scales, which, when examined under the microscope, are found to be very beautifully reticulated.

The venation and fructification of this fern appear to have been greatly misunderstood: even Presl, who lays so great stress on these characters, has totally misrepresented them. The lateral veins are few in number, alternate, and irregularly branched; the branches occasionally anastomose before their termination, as represented by the figure in the margin: the anterior branch of each bears an elongate cluster of capsules; these are situated about midway between the midrib and margin of the pinna: the points of their attachment are indicated in the figure: the first anterior lateral vein usually bears two of these clusters of capsules, one on each of its principal branches. The capsules are attached to that side of the vein which is nearest the median line of the pinnæ, and not on the back of the vein, in this respect following the formula of the other *Aspleniaceæ*, and totally differing from that of the *Polypodiaceæ* and *Aspidiaceæ*. It should, however, be observed that the capsules seated on the vein nearest the main stem of the frond, are placed in a position opposite to that of the rest, and, in this instance, the dehiscence of the involucre may be said to take place towards the main stem. Immediately adjoining the insertion of the capsules, and attached to the back of the vein, is an erect, white, membranous involucre, exactly corresponding in length with the line of capsules with which it is connected. In a very

early stage of the plant, before the frond is perfectly unfolded, I have found this involucre somewhat incumbent on the capsules, but it very soon assumes its erect position, and as the capsules advance towards maturity, its character is lost, and it is only to be recognized by those who have made themselves thoroughly acquainted with it in its earlier stages. Beneath the capsules is a very inconspicuous ridge, and this also accompanies each line of capsules throughout its whole course. This ridge is so minute, so nearly imperceptible, that I merely notice its existence because one author appears to have regarded it as a second involucre. Sir J. E. Smith says, — "Covers one at each side of each mass, as in the preceding species [*Scolopendrium vulgare*], erect, membranous, continuous, undulated, entire, quite distinct from the pointed separate scales. I cannot ascertain whether the lines of capsules are originally double, as in *Scolopendrium vulgare*, but the covers are evidently such as leave no doubt of the genus, answering exactly to Tournefort's figure, which Swartz and Willdenow surely did not examine. The latter indeed has well removed this fern from *Grammitis*, to which indeed it has no natural affinity."* I may observe that the doubt here expressed as to the lines of capsules being originally double, or in other words, seated on two parallel and approximate veins, admits of a ready solution. A reference to the figure in the margin will at once show that this is not the case. Again I cannot allow the reference to Tournefort's figure† to pass unnoticed, for on turning to that it will be obvious to every one that the learned author has not figured the part now described as an involucre; indeed the figure in question does not represent the frond denuded of its scales, and consequently the real involucre is totally concealed. I am therefore quite inclined to believe Smith has fallen into an error, in supposing he had seen any involucre connected with the fructification of *Ceterach*. Roth's description, which I have quoted below, nearly resembles Smith's, and speaks of a double involucre: ‡ it bears many

* Eng. Flor. iv. 303. † Inst. Pl. 318.

† Fructificationum maculæ oblongæ, duæ, tres vel quatuor in aversa segmentorum pagina, interveniæ, apice nervum segmenti respicientes, ob squamu-

indications of being a record of real observation, and yet what is said of the involucre does not convey an exact idea of its appearance. I am not prepared to say that this very accurate author is wrong in thus describing a double involucre; but granting that the second is an involucre, its great discrepancy in prominence should surely have been noticed. Willdenow, Swartz, Sadler and Hooker, deny the existence of an involucre in *Ceterach*, and thus totally destroy its natural affinity with the *Aspleniaceæ*. For a long time, owing to a too hurried and superficial examination, I overlooked this important character, and I am indebted to Mr. Wilson for first calling my attention to its existence. I now fully concur in Mr. Wilson's views as to its presence. Mr. White and Mr. Jenner have also kindly and zealously assisted in the enquiry with a similar result.

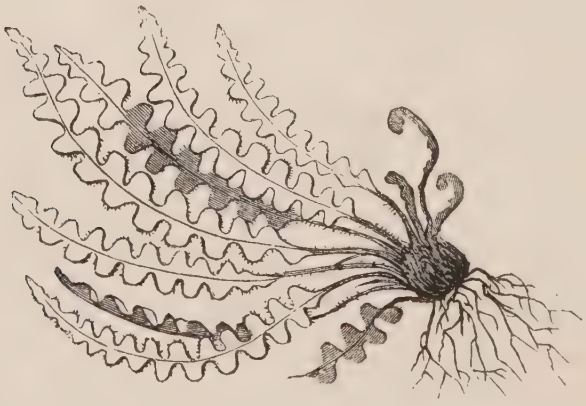
Mr. Wilson considers that some of the scales which cover the back of the frond are ranged in a linear series on the involucre itself: this observation I have been unable to verify, probably from my want of skill in manipulation. In order to obtain a perfectly satisfactory view of these parts, it is not only necessary to obtain fronds in a very young state, even before they are fully unfolded, and before they have had the least opportunity to become dry or withered, but it is also requisite carefully to denude the frond of its scales, removing them one by one while the object is still under the glass. Whoever may hereafter take this trouble, will, I am persuaded, fully concur with me in assigning to *Ceterach* a true involucre, closely resembling that so observable in the genus *Asplenium*.

Mr. Smith, of Kew, without whose concurrence I scarcely feel confident of even my own observations, has favoured me with his views on this interesting subject. It will be seen by the following quotation from his letter that he has not yet

---

larum copiam et densitatem ægre discernendos e duplici capsularum serie conflatæ, tectæ Involucro duplici, membranaceo, superficiario, in medio demum secundum longitudinem dehiscente, bivalvi et tandem effusis capsulis per totam segmenti paginam, non ultra distinguendo. Capsulæ subrotundæ, pellucidæ, annulo articulato, purpureo, minus pellucido cinctæ. Semina fusca, exigua.—Roth, Flor. Germ. iii. 49.

observed the involucre, but at the same time his remarks will show that he considers the species as belonging to the family in which I have placed it. "With respect to *Ceterach* having an indusium, you will see that, according to my view, in the 'Journal of Botany' I have placed it in *Asplenieæ*, which tribe is characterized as having the sporangia produced on one or both sides of the veins, and furnished with an indusium that rises from the same axis, but more from the upper side (or surface as it may be termed) of the vein, the sporangia being in the early state pressed down by it, and in true *Asplenium* pointing inwards, — that is, to the primary midrib of the segment or pinnule, &c. Now although I can find no evident indusium in *Ceterach*, yet the circumstance of the sporangia being lateral is of itself sufficient to induce me to consider it as belonging to *Asplenieæ*, and the absence of an indusium is, in my opinion, owing to its being suppressed by the dense mass of scales common to the plant. In my character of the genus *Ceterach* I have said 'indusium obsolete,' and although I have not seen anything like a membrane, still there is a thickening of the vein above the axis of the sporangia."



BRISTLE FERN, (*half the natural size*).

TRICHOMANES SPECIOSUM, Willdenow, Babington.

Trichomanes brevisetum, Smith, Hooker.

THIS appears to me the most interesting of all our ferns: whether we regard its rarity, its beauty, its excessive susceptibility to injury from exposure when in cultivation, its entire absence from all European countries or islands, with the single exception of Ireland, or its remarkable botanical characters, — somewhat combining those of true ferns, mosses and seaweeds, — it cannot fail to be regarded with feelings of deep interest.

In texture as well as scent our British *Trichomanes* particularly resembles some of the marine *Algæ;* and I have found it to assume the same life-like appearance on immersion in water, after being kept perfectly dry for many years; this property is also observable in *Hymenophyllum.*

When I speak of its absence from Europe and European islands, with the single exception of Ireland, it must not be supposed that I have overlooked the record of its former occurrence in Yorkshire. Doubt and difficulty seem to beset this record on every side, yet in a work professing to be a history of British Ferns, I believe it advisable to publish all the information that can be collected on the subject. In Ray's 'Synopsis' we find a figure* so like some of the specimens gathered near Killarney, as to have convinced all subsequent botanists that it was intended for the present plant: there is a second figure† which professes to represent the young state of the plant, but which not only carries with it no evidence of identity, but is so totally unlike the seedling plants of *Trichomanes* reared by Mr. Andrews of Dublin, that a careful observer must hesitate long before admitting that the two plants represented in the 'Synopsis' have any connexion with each other. The plants represented in both these figures were "found by Dr. Richardson at Belbank, scarce half a mile from Bingley, at the head of a remarkable spring, and nowhere else that he knows of."‡ The description, quoted at length below,§ seems, as far as it goes, tolerably applicable to the present plant; but it should be observed that neither the figure nor the description notices the fruit which forms so important a diagnostic of *Trichomanes speciosum.* The second notice of this locality is in Bolton's

* Syn. tab. iii. fig. 3. † l. c. fig. 4. ‡ Syn. 127.

§ Filix humilis repens foliis pellucidis et splendentibus, caule alata *D. Richards.* An Onopteris major *Tab. l c.* 796 ? mas. *Ger.* 975 ? Caules singulari huic plantæ alati sunt et virides, nisi inferius, ubi ex fusco nigrescunt. Radix villosa est et hirsuta, repens, quod non exprimitur in figura Tabernæmontani, ipsam alias plantam satis bene referente. Seminalia nondum comparuere, quo minus constat, an eadem sit hæc planta cum Filicula pyxidifera *Plum. Fil. Amer. Tab.* 50, cui sane simillima est. Folia tenuia, pellucida et splendentia, coloris saturate virentis.—Syn. 127.

'Filices,' where I find the following statement appended to his *Trichomanes pyxidiferum*. — "First discovered by Dr. Richardson in a little dark cavern under a dripping rock, a little below the spring of Elm Cragg Well, in Bell Bank, scarce half a mile from Bingley. In this place I saw it in plenty in the year 1758: afterwards, some alterations being made about the well for the convenience of the proprietor, the cavern was destroyed, the plant perished, and was lost to Great Britain till the year 1782, at which time being engaged in this work, and passionately desirous to see the plant again in its growing state, after several researches in Bell Bank, I found a root under a dripping rock, to the left side of the current, and about fifteen yards above the cistern. From this root I have sent specimens to one or two of my friends, and have in my possession the best of them, from which this figure and description were taken."* We have here evidence of an observant botanist rediscovering and republishing the locality, and expressing no doubt whatever that his plant was identical with Dr. Richardson's: his figure and description, moreover, are cited by Smith as applicable to the present species; and yet it seems to me not improbable that our *Hymenophyllum tunbridgense* was the plant which Bolton intended to figure and describe. In the year last mentioned by Bolton (1782), a similar plant seems to have been observed by Mr. Teesdale, as recorded in the following passage from the 'Linnean Transactions.'—"*Trichomanes pyxidiferum*, Huds. In September, 1782, I found this rare plant in Belbank wood, near Bingley, the place mentioned in R. Syn. Whether it be only a variety of the following [*H. tunbridgense*], I leave to the decision of those who may have frequent opportunity of examining it in the place of its growth."† From this the reader may, however, infer that Mr. Teesdale hesitated to consider the fern distinct from *H. tunbridgense*. Sir J. E. Smith, under his *Trichomanes brevisetum*, after quoting Ray's habitat, observes, "Found there by Mr. Dickson and Mr. R. Teesdale long afterwards, in a young state, only like fig. 4" of Ray's Synopsis, plate 3. I know not how Sir James obtained the information

* Bolt. Fil. 56. † Trans. Linn. Soc. v. 75.

that the plant so positively spoken of by Teesdale was nothing more than Ray's figure 4, but presuming on his accuracy, and certainly being unable to refer the said figure to any known species of *Trichomanes*, we must of necessity regard Ray's figure as the authority for considering *Trichomanes speciosum* an English plant. I have little doubt that the species called *tunbridgense* by Bolton, Hudson and Teesdale, and described as common in Wales and the north of England, is the *Wilsoni* of modern nomenclature, while their *pyxidiferum* may be our *tunbridgense*. I must, however, beg the reader, who is desirous of pursuing the subject, to consult Hudson's specimen of this fern now in the British Museum, and a series of minute specimens in the Smithian herbarium now in possession of the Linnean Society.

From this fruitless enquiry I turn to Ireland, where I have stood amid the roar of waters gazing on hundreds of the dark green fronds of this fern, as they waved to and fro in the agitated air, and sparkled with myriads of sun-lit drops. I am told that this scene is to be gazed on no more; that all its beauties have been ruthlessly destroyed; and that Turk may become what Belbank is now,—the locality for a mere tradition. In Ireland, however, the plant is destined to exist; its stations are too numerous for all of them to be destroyed, and my list — alas! that it should be so—is curtailed by promises of secrecy which I was willing enough to make; for when I see the devastation caused by directions I have formerly published, I cannot blame the spirit of concealment to which I allude. Notwithstanding such restrictions, it will, however, be seen that my list is tolerably comprehensive.

Cork. — Mr. R. Ball informs me that he found this fern in luxuriant profusion in Glendine, near Youghal. It was found in 1841, by Mr. James A. Fisher, in Glenbour, Killeagh, also near the town of Youghal; it was growing in a cave, and in considerable abundance, Mr. Fisher having supplied several botanists with whom I correspond; but when he visited the cave during the subsequent year, he found that a fire had been kindled immediately under the spot where the fern was growing, and it has been by this means almost entirely destroyed. In

Temple Michael Glen, near Cork, it has been noticed by several botanists, but I am informed by Mr. S. P. Woodward that in August, 1843, there was very little left; Mr. Woodward also informs me that at the Cork meeting of the British Association he saw recent specimens which had been gathered near Bandon, in this county. "It was once found in Ballinhasy glen, near Cork."—*Francis' Analysis.*

KERRY. — The celebrated station at Turk waterfall, near Killarney, was discovered by Mr. Mackay in 1804; he observed the plant in considerable quantity and producing fruit. This station has been visited subsequently by many botanists and tourists; among the latter tribe I may include myself: I first observed it to the left of the seat whence visitors usually take their first view of the cascade. About fifteen yards higher up the stream the rocky bank on the left projects into the river; this projection is only to be reached by striding from stone to stone along the bed of the stream, which, in times of flood, as appeared to be the case when I was there, is rather an exciting and ticklish operation. Having reached the projection, I ascended it without difficulty, by the assistance of the boughs and roots of trees; and on the top is a little platform, standing on which I saw the bank close before my eyes robed in *Trichomanes.* It was a beautiful sight. The guide* at this waterfall, subsequently to my visit, has sold pieces of the fern as a "curiosity of the place" to all visitors, until he had nearly succeeded in eradicating it. Captain Jones informs me that in 1826 he collected specimens two hundred yards above the waterfall. Mr. Wilson, and my lamented friend Mr. W. Christy, found a third locality in a ravine of Cromaglaun mountain. Mr. Wilson informs me that another station was known to Mr. Scott, and another to Miss Hutchins. Mr. Robson has subsequently found it higher up the stream than the station mentioned by Captain Jones, and that in such plenty as to procure a number of roots, which he has planted abundantly, not only about Killarney, but about Glengarriff and in Valencia Island. Although the inten-

* Guide; in Irish, a person who lurks about all places visited by tourists, to extort money from them.

tion in doing this is perhaps a good one—that of preserving in Ireland this interesting species — yet I fear it will scarcely meet with the approbation of botanists generally. To conclude my notice of the Killarney district, I may state that several botanists visiting that neighbourhood subsequently to the meeting of the British Association in 1843, found this fern in a great number of localities : these, however, they decline giving to the public, fearing lest such publication should lead to its extermination. Mr. S. P. Woodward informs me that Dr. Taylor has discovered a station at Gortagaree, between Killarney and Kenmare ; Mr. Moore has found it at Mount Eagle, near Dingle ; and Mr. Andrews at Blackstones, in Glouin Caragh : for Kerry specimens and much valuable information respecting them, I am indebted to Mr. Andrews, Mr. Foote, Mr. Ogilby, Mr. Mackay, Mr. Moore, Mr. Dennes and Mr. Pamplin. Mr. Andrews and Mr. Foote were travelling in company, when the former discovered the Blackstones locality. " It was growing in a wild and romantic cave, the rocky walls of which had been for ages covered with a drapery of the overlapping fronds, hundreds of which, hanging gracefully down, formed a pendulous mass of the loveliest green, which contrasted strikingly with the sombre hue of the Killarney plant : the rhizomata, spread over the moist surface of the rock, formed a reticulated and tenacious covering." These gentlemen left it in all its beauty for other visitors, who, like themselves, might hold such a scene as too beautiful for destruction, but alas ! their example has been unheeded. Mr. Andrews continues, " in September last a ruthless botanical pirate, who discovered the spot, tore the ferns from their retreat, and fractured the hard surface of the rock, that not a vestige of the plant might again rear itself."

Wicklow. — I am informed by Mr. W. Thompson that, according to the MSS. of the late Mr. Templeton, this fern was first found in Ireland by Dr. Whitley Stokes, at Powerscourt waterfall, in this county : at no time did it exist here in any quantity. Mr. Mackay informs me he has seen a single plant here as well as at Hermitage glen, also in this county, where it was first found by Mr. Nuttal. I believe many years have elapsed since any botanist has found it in this locality.

There is a good figure of this fern in Hooker's 'Flora Londinensis,'* under the name of *Trichomanes alatum;* and another in 'English Botany,'† under that of *Hymenophyllum alatum.*

It has already been stated that this plant is supposed to be *Filix humilis repens* of Ray's 'Synopsis.' Passing over the synonyms of Hudson, Bolton, Withering, and Berkenhout, which, although usually supposed to be intended for the present plant, must be received with doubt, we come to the description by Brown in the 'Hortus Kewensis,'‡ who considered the species new, and gave it the name of *Trichomanes brevisetum*, which has been adopted by most modern botanists. Smith, in Rees' 'Cyclopædia,'§ described it as *Trichomanes europæum;* and Sprengel, in his 'Systema Vegetabilium,'‖ as *Trichomanes hibernicum.* In preparing this work for the press, I endeavoured, but without success, to find characters by which to distinguish it from the well-known *Trichomanes speciosum* of Willdenow, an inhabitant of Madeira, Teneriffe, &c., some beautiful specimens of which had been recently brought to England by my late lamented friend Mr. William Christy. Believing the Irish and Madeira plants to be identical as species, I consulted my kind adviser, the late Professor Don, and he quite agreed with me in the propriety of restoring Willdenow's name; since which the authors of the 'Edinburgh Catalogue,' and Mr. Babington in his 'Manual,' have followed my example, but Sir W. Hooker retains the name of *T. brevisetum.*¶ Willdenow's description is quoted below,** in order that those who may not happen to

* Flor. Lond. 53. † Eng. Bot. 1417. ‡ Hort. Kew. v. 529 of 2nd ed.
§ Rees' Cycl. Art. Trichomanes. ‖ Sprengel, Syst. Veg. iv. 130.
¶ Brit. Flor. 445 of the 5th ed.

** Trichomanes speciosum, *W.* T. frondibus, &c. Caudex repens crassitie fili emporetici mediocris, setis paleaceis nigro-fuscis tomentosus. Stipes sex-pollicaris semiteres canaliculatus, tenuissime marginato-anceps, glaber. Frons quadri- vel quinque-pollicaris, circumscriptione subrotundo-ovata, triplicato pinnata. Pinnæ primariæ inferiores tripollicares, superiores sensim breviores. Pinnæ secundariæ semipollicares. Pinnulæ tri- vel quadri-lineares confluentes, pinnatifidæ laciniis lineari-lanceolatis obtusiusculis integerrimis, inferioribus interdum marginatis. Rachis primaria et secundaria margine foliaceo alata. Indusia cyathiformia turbinata, laciniis sub apice inserta. Receptaculum filiforme trilineare indusio quadruplo longius.—W. Sp. Pl. v. 514.

possess his 'Species Plantarum' may have an opportunity of comparing it with the plant.

The roots of *Trichomanes speciosum*, as well as the rhizoma, a good deal resemble those of *Polypodium vulgare:* the rhizoma is black, tomentose, tough, and remarkably long: I have collected specimens which must have been many yards in length, and I observed these rhizomata formed a kind of network over the surface of a rock, to which the roots were slightly adhering: this I found to be a character of the plant when most luxuriant, but I discovered other smaller plants possessing more root and less rhizoma, and having the roots fixed in a thin layer of moist earth, among a profusion of moss and *Hymenophyllum*. "The formation of the young frond takes place about May; the stem then gradually lengthens, without much development of the circinate character of the frond till September, when a more rapid growth takes place; about November the full length of the stem is attained, but the pinnules are not perfectly formed, nor has the frond attained its full development until the autumn of the second year: no disposition to bear fruit is shown until the autumn of the third year, when the involucres appear, and the setæ and capsules attain maturity in October. It is very rarely that the seed attains maturity in this country: the capsules are formed within the involucres around the setæ, but do not attain sufficient ripeness and elasticity to burst and discharge the seeds." Mr. Andrews, from whose letters this description is copied almost in his own words, believes that in Ireland the seeds are only matured in dry and warm seasons; and he adds that when the fronds are in a moist situation, and do not fruit, they will preserve their evergreen verdure for many years, but when they fructify in perfection, at the third year, the pinnules assume a brown withered appearance, and the entire frond evinces symptoms of incipient decay. The tomentose covering of the rhizoma is found, under a lens of high power, to consist of articulated bristles, which are evidently analogous to the scales on the stems of other ferns: they may be seen most abundantly on the young frond before it has unrolled, and may be found scattered here and there on the stem after the frond has attained maturity: they are of a rich brown colour, the

dilated portions being slightly transparent. I have attempted to show the structure of these bristles in the figure which I have introduced in the margin. Intermixed with these bristles are others much finer, much shorter, and more transparent; and these, under a lens of sufficient power, are also found to exhibit traces of articulation. The tomentose appearance of the roots is due to these minute bristles.

The form of the fronds is between lanceolate and triangular, those from Glouin Caragh approaching the former, those from Killarney the latter form. They are pinnate, the pinnæ being alternate and pinnate, and the pinnules deeply divided or pinnatifid. Perhaps it would be more correct to describe the hard, wiry, stem-like veins, as thus divided, and to say that each of these veins is furnished on each side with a semi-membranous wing extending throughout its length, for this is really the case in all the *Hymenophyllaceæ* that I have examined: the entire frond is composed of these wings, and consequently all its divisions are narrow and linear. This wing extends also to the stem, which is about equal to half the frond in length.

The fructification may be thus described: the cluster of capsules is small and nearly spherical, and is attached to the centre of a vein after its ultimate division: at the point of attachment the wing partially loses its green and semi-membranous appearance, becomes more opaque and of a whitish colour, and assumes a form something like that of a champagne-glass around the cluster of capsules; the capsuliferous vein passes through this cup, and projects beyond it, often exceeding it four times in length. It is the general custom of botanists to speak of the cup as an *involucre*, and of the bristle-like exserted vein as a *receptacle*.

It has been lately supposed by many excellent botanists that there are two Irish species of *Trichomanes*,—the Killarney and the Glouin Caragh plants: I will now proceed to lay before my

readers all the information I can collect on the subject, and then allow them to draw their own conclusions. The first notice I find of the Glouin Caragh plant is by Mr. Mackay, at the December meeting of the Dublin Natural-History Society in 1842. "Mr. Mackay, of the College Botanic Garden, in commenting on the beautiful specimens of *Trichomanes* exhibited by Mr. Andrews this evening, and on their finely developed state of fructification, observed that the first discovery of this rare and beautiful fern in Ireland was made by him in 1804, about which time he forwarded specimens to Sir Edward Smith, who figured it in the 'English Botany,' under the name of *Hymenophyllum alatum*, from its winged stem. There was also exhibited before the meeting a true specimen of the Madeira plant, *T. speciosum* of Willdenow, which the late Right Hon. George Knox had brought to him in 1811 : this plant, in the short state of its receptacles, its triangular-shaped frond, and its densely tripinnate pinnæ, was identical with the beautiful specimens in such fine fructification now before them of the *T. brevisetum* of Killarney. The other specimens were those of a discovery made by Mr. Andrews this autumn, in a district remote from Killarney, and he confessed that he had never before seen such, either from their large size, or from the splendid state of fruit they exhibited. There was another peculiar, and, he considered, distinctive, feature in the lanceolate form that all the fronds possessed, the bipinnate and not crowded state of the pinnæ, and the still more remarkable character shown, that of the receptacles being five, and even six times longer than the indusia. These distinctions (from his own long experience and knowledge of these beautiful ferns, having succeeded for many years in cultivating them to perfection under glass in the conservatory), led him to state that he conceived the specimens produced by Mr. Andrews to be perfectly distinct from *T. brevisetum*."

The next notice I find on this subject is in the report of the late meeting of the British Association, held at Cork, in August, 1843. It appears that Dr. Allman on this occasion exhibited specimens of the Glouin Caragh plant, calling attention to the characters already pointed out; and that Mr. Mackay again expressed "his conviction that it was a new species."

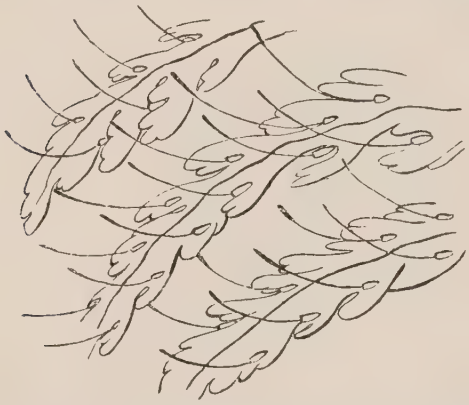
Mr. Andrews has obligingly furnished me with the following characters of the two plants. The first I will call

Trichomanes speciosum var. *Andrewsii*, (natural size).

"*Trichomanes* ——? Frond lanceolate twice pinnated, lower pinnæ distant short, ultimate segments of the pinnæ decurrent serrated lobed linear acute. Rachis winged, very long. Receptacles six times longer than the involucra. Root long scarcely tomentose. Habitat, moist rocky cave, Glouin Caragh, Kerry.

"*Trichomanes speciosum.* Frond angular thrice pinnated, lowest pinnæ longest densely crowded and tripinnated, lobes of the pinnæ linear blunt. Rachis winged, short. Receptacles two or three times longer than the involucra. Root thick densely tomentose. Habitat, Turk, Killarney; Glouin Caragh; Mount Eagle, Kerry."

Mr. Andrews further observes, that "the striking character of the Glouin Caragh plant is the amazing length of the receptacles, which, in the growing state of the plant, turn up from the involucra in a curved manner, [see figure in the margin] showing a most bristly appearance over the entire frond: all the fronds presented the lanceolate character, the lower pinnæ being distant and short; the ultimate segments of all the pinnæ are serrated, the pinnules being decurrent and running to a point; the entire length of the frond was sixteen inches, and from the base of the lowest pinnæ to the apex of the frond eleven inches."



In opposition to the views expressed by these three eminent botanists, I will cite that of Mr. Moore, who says, "I think the *new Trichomanes* to be nothing more than the old plant fully developed, and more attenuated in all its parts, and that this is caused by the dark warm habitat in which it grew. In order to prove whether the old plant could not be altered by being subjected to a different kind of treatment, I had a good healthy pot placed under the stage of a green-house, where it got very little light, and over the glass a piece of old carpet was thrown which was kept constantly saturated with water, so that I considered the plant placed nearly in a similar position to that in which the new plant was found. I soon found that the fronds might be lengthened to an almost incredible extent, and that they became more simple in their appearance; in both these respects well agreeing with the plant discovered by Mr. Andrews." No fruit has been produced, so that it remains a question whether the *receptacle* also can be elongated by this treatment. Mr.

Ogilby, of Dublin, whose name I have before mentioned as a kind contributor of specimens, seems quite to coincide in Mr. Moore's view of the case.

In accordance with the views previously urged, when describing *Cystopteris fragilis* and *Lastræa multiflora*, I have endeavoured to compare the most mature and perfect fronds from each locality, and the result appears to be 1st — that the specimens from Glouin Caragh are far more mature and fruitful than those from Killarney: it is a rare thing to obtain specimens from the latter station in a thoroughly mature state; I think I may say that not one frond in fifty exhibits involucres, and not one in many hundreds attains the perfect development and fruitfulness displayed by the Glouin Caragh plant; but 2ndly — I find that the most mature of the Killarney specimens most recede from the Glouin Caragh specimens, a circumstance rather opposed to the supposition that the two are identical, since in general we find ferns developing their specific differences more strikingly as they approach perfection. 3rdly — The length of receptacle is another test of perfection: the Killarney plant, grown at Killarney, has a receptacle of very different length; in the most perfect specimens it is at least four times as long as the involucre, in the least perfect it scarcely protrudes beyond the involucre, and under cultivation it is seldom to be seen at all, thus evidently proclaiming that its length in some measure depends on health, maturity, and a congenial situation. Willdenow, in the passage cited, describes the receptacle as four times the length of the involucre; and I cannot assert either that its frequent departure from this character at Killarney proves anything more than that such departure is a testimony of imperfection, or its attaining this character at Glouin Caragh is to be attributed to any other causes than congenial situation. The form of frond may be capable, as Mr. Moore asserts, of great elongation, but there is no evidence that the relative length of the pinnæ is also altered: it appears to be a fundamental character of a deltoid frond that the lowest pair of pinnæ shall be longer than the second pair, the second longer than the third, and so on; and, as far as I am aware, this character is constant in cultivation; at least I can safely assert that it is so in *Asplenium*

Adiantum-nigrum, *Lastræa recurva*, &c. The apex of the frond is often lengthened very remarkably, but the lower pinnæ almost invariably partake of a similar elongation. In lanceolate fronds, the lowest pair of pinnæ are usually shorter than the second pair, the second shorter than the third; and this character in *Asplenium lanceolatum*, *Lastræa multiflora*, &c., remains unaltered under any condition. Now the two *Trichomanes*, although less decidedly deltoid or lanceolate than the ferns I have cited, follow the same law, each preserving respectively its deltoid or lanceolate tendency under cultivation.

Again there is a decided difference, as far as I can learn from my limited materials, in the involucres of the two plants. In the Killarney plant the involucre stands out distinctly from the membranous frond, and appears almost stalked, while in all my specimens of the Glouin Caragh plant it is more or less united with the frond by a continuous margin or wing; this will perhaps become more evident from an inspection of the figures at page 320, which fairly express the differences observable in my specimens from each station. Supposing that the deltoid and lanceolate fronds are constant in each plant, and that the exserted and partially imbedded involucres are also constant, I think there can be little doubt that Mr. Andrews's plant claims the rank of a species; the extraordinary length of the receptacle, the less divided state of the frond, and the less tomentose rhizoma, so ably pointed out by the Irish botanists, will furnish additional support of such a decision, although I scarcely like to take either of these as a specific character. Still I hesitate to add a species to our British Ferns unless possessed of more ample means for forming an opinion; and I give to the plant the name of *Andrewsii* as a *variety only*, respectfully begging of subsequent describers, that should their views coincide with mine, they will still allow the plant to bear the name of a naturalist to whose ardour and intelligence the science of Botany is under so many and such important obligations.

The cultivation of this beautiful fern has occupied the attention of many botanists: I believe Mr. Mackay of Dublin, and Mr. Ward of London, were the first whose efforts were attended with success. Mr. Ward possesses a plant which for many

years has been in the most healthy and vigorous condition, but it has rarely shown any indication of producing seed. Mr. Andrews appears to have been still more successful: he says, "in September, 1841, I formed a case purposely for cultivating this fern. I lined the bottom with zinc, and covered the frame-work with oiled lawn. I then planted my specimens in well-drained pots, in a compost of loam and coarse sand, interspersed with pieces of turf. I also suspended the roots [rhizomata] across the roof of the case, attached to rods covered with bass-matting and moss. The plants were kept cool, and were well moistened daily, and I have now (Oct. 24, 1843) a splendid display, the entire case being filled with fronds of large and strong growth. No other fern will thrive well in the case with the *Trichomanes*, the treatment required to cause the *Trichomanes* to flourish being destructive to the other. The *Trichomanes* will *live* or even *grow lazily* in a glass with other ferns, but will never attain a vigorous state of growth. The cultivators of *Trichomanes* are under a mistake in supposing that the plant was in a fine state of fructification, merely because the involucra had been produced. I have never seen the setæ perfectly exserted in cultivation, and the capsules attached in a ripening state. It was late in September when I discovered the Glouin Caragh plant, and I collected a quantity of the capsules, but I could not detect the sporidia thrown out by the bursting of the ring of the capsules. I scattered the capsules on well-moistened pieces of turf, on patches of growing mosses, and on a compost of loam and sand: after a lapse of four months those on the turf and moss became green, gelatinous masses; at the end of eight months they became of a lively green colour, and had much the appearance of a *Jungermannia*, cellular and beautifully reticulated; and now, at the end of twelve months, they have sent out a wiry and rigid rachis, with an attempt at the formation of pinnules. I send you rough sketches of them." [See the figures in the margin.]

The genus *Trichomanes*, as restricted by Sir J. E. Smith and nearly all modern botanists, appears to depend on "the cover" consisting "of one leaf," and the capillary point of the receptacle projecting "beyond the cover." The value of the first of these characters appears to me very slight, for it is impossible to look at one of the involucres of the present fern without immediately perceiving that it is composed of two equal parts, united by an incrassated suture, which is accompanied throughout its length by an external margin or wing; this is very slender, and almost obsolete in the Madeira and Killarney plants, as already noticed, but strikingly developed in the Glouin Caragh plant, as well as in the closely-allied West-Indian *Trichomanes alatum*, and several other cognate species. Of the figures introduced below, *a* represents the usual and scarcely varying appearance of the Killarney plant, while *b*, *c*, *d* and *e* represent different states of the Glouin Caragh plant. The other character, the relative length of the involucre and receptacle, seems very fallacious, since the development, and even the presence of the latter, is very uncertain and irregular.

a *b* *c* *d* *e*

TUNBRIDGE FILMY FERN, (*natural size*).

HYMENOPHYLLUM TUNBRIDGENSE, Smith.

THE little moss-like ferns which constitute the genus *Hymenophyllum* are found growing on the surface of rocks and stones, in moist and shady situations. Unfortunately in my endeavours to draw up a summary of habitats, I can derive but little assistance from the 'Botanist's Guide,' since its learned authors do not distinguish between the species, but treat them both as one; and, therefore, a doubt must attach to the species found in the localities which I have quoted from that work. The other English and Welch habitats of *H. tunbridgense* have been supplied by correspondents on whom I can confidently rely.

CORNWALL. — Mr. Babington and Mr. Borrer inform me they have found this species at Rough tor, near Camelford; Miss Warren in two places in a wood near Penryn; and Mr. Peirson at College wood, near Penryn.

CHESHIRE.—"On mossy rocks near Croyden brook, the eastern extremity of Cheshire, and on the hills from Macclesfield to Buxton in similar situations: Mr. Bradbury." — *Botanist's Guide.*

Devonshire. — The Rev. W. S. Hore has found it in company with *H. Wilsoni*, on rocks adjoining the Plym, near Shaugh bridge; and Miss Griffiths has observed it at Bishleigh vale, South Devon.

Glamorganshire. — Mr. Westcombe informs me he found it at the Melincourt waterfall: it may be added that one of the species — but I cannot satisfactorily ascertain which of them — occurs abundantly at Pont Nedd Vechn.

Kent. — Just within the limits of the county, at Tunbridge Wells.

Lancashire. — Mr. S. Gibson has found it at Cliviger; Mr. Sidebotham sparingly in caves at Greenfield; and Mr. Simpson near Coniston.

Merionethshire. — Mr. Wilson informs me he has received specimens from Crofnant, near Harlech; Mr. Ralfs that he has found it near Dolgelly, and near Barmouth; and Mr. H. C. Rothery in the vale of Festiniog.

Somersetshire.—In Sole's MS. Flora of Somersetshire, it is said to grow in a shady lane near Shipton Mallett.

Sussex. — "Mr. Dare found it near Tunbridge; found also plentifully by Mr. Rand, in company with Mr. Sherard, amongst the pebbles at Cockbush, six or seven miles from Chichester, in the county of Sussex." — *Ray's Synopsis.* Mr. Borrer informs me it occurs in the crevices and on the perpendicular sides of sand rocks about Tunbridge Wells, West Hoathly, Ardingley and Handcross. Mr. Jenner speaks of its occurrence here and there on the sand rocks throughout the county.

Yorkshire. — Mr. Spruce informs me it has been found by Mr. Peterkin on rocks by a stream running down to the sea, at a place called Hayburn-wyke, near Whitby; Mr. Wilson has found it near Halifax, and near Greenfield; and Mr. S. Gibson near Todmorden.

In Scotland this pretty little fern does not appear of common occurrence: the following habitats have been kindly supplied me.

Argyleshire. — Mr. Gourlie informs me he has found it at Bullwood and Dunoon.

Dumbartonshire. — Mr. Gourlie has met with it abundantly on the banks of Loch Lomond.

Dumfriesshire. — Mr. Cruickshank has found it on rocks at Drumlanrigg bridge.

In Ireland this fern is not generally distributed, being confined to those romantic parts of a few counties which have for many years attracted the notice of tourists.

Kerry. — In the vicinity of Killarney it attains a degree of luxuriance and profusion that I have never observed elsewhere: it is almost invariably intermixed with *Wilsoni*, and sometimes also with *Trichomanes speciosum:* it not only covers the rocks, but even clings to the bark of trees, ascending them to a height of two or three feet, and presenting a very beautiful appearance.

Wicklow.—Mr. Mackay informs me it occurs at Powerscourt waterfall, Glencree, and several other places in this county.

A species of *Hymenophyllum* occurs under the name of *tunbridgense* in the Floras of Germany, France, Italy and Sweden. From the 'Flore Française' we learn that in France it grows amongst moss on the trunks of trees; and a closely-allied species, often indeed bearing the same name, has been received from New Holland, South Africa, and South America.

The figure of this fern in Sowerby's 'English Botany' * is sufficiently exact, and that in Hooker's 'Flora Londinensis' † is still better. The figure in Bolton's 'Filices' ‡ appears to be drawn from the next species.

This plant is the *Trichomanes tunbridgense* of Linneus,§ Hudson,‖ and many of our earlier authors: it was separated by Smith as a genus in the fifth volume of the Turin Transactions,¶ and the name has been adopted by nearly all subsequent botanists, a strong proof of the weight of Smith's authority, for even now, when generic subdivision has extended to so great a length, we have no new genera founded on such imaginary differences as those which separate *Hymenophyllum* from *Trichomanes.* In my endeavours to draw a line between these genera I have been totally unsuccessful: if we regard the exserted receptacle of the one, or the bivalved involucre of the other, the only conclusion at which we can arrive is this — that those species with

* Eng. Bot. 162. † Flor. Lond. 71. ‡ Bolt. Fil. tab. 31.
§ Sp. Pl. 1561. ‖ Flora Anglica, ii. 461. ¶ Act. Taur. v. 418.

the longest receptacles at present stand in *Trichomanes*, those with the most distinctly bivalved involucres in *Hymenophyllum*. These, however, are mere questions of degree, and are quite insufficient to guide the botanist who—without a prior knowledge of a plant — seeks, by means of books, to ascertain its generic and specific names. It must not, however, be understood that I object to the subdivision of the Linnean genus *Trichomanes;* so far from this, I trust the time is not far distant when some competent botanist shall rearrange the entire group, pointing out characters that admit of no dispute, and leading us on to a far more accurate knowledge of these beautiful plants than we can hope to glean from any works yet before the public.

The roots are black, wiry, and very slender; the rhizoma long, black, slender, wiry and creeping. The fronds consist of branched series of veins, each being clothed with a membranous or filmy wing, the structure in this respect being exactly similar to that of *Trichomanes:* the branches or pinnæ are alternate, and each is more or less subdivided; the divisions or pinnules are mostly in pairs; the margin of the wing is crenate or denticulate. The clusters of capsules are nearly round, and each is seated almost at the extremity of a short vein, which in each pinna is next adjoining the midrib of the frond. The wing, or membranous portion of the frond, is divided below the cluster of capsules, and encloses it as in a kind of cup, which is usually called the involucre: the upper margin of this involucre is notched and uneven; the capsuliferous vein or receptacle does not extend beyond the margin of the involucre. In exotic species, scarcely distinguishable in other respects, the involucre is discernible just beyond the margin, and such species are consequently allowed to retain the Linnean name of *Trichomanes.*

WILSON'S FILMY FERN, (*natural size*).

HYMENOPHYLLUM WILSONI, Hooker.

THE range of this species in Great Britain appears to be much more extensive than that of *H. tunbridgense:* it also seems to be a more northern species, and generally to prefer a greater elevation: still, as already stated, the two plants are often intermixed, particularly about the waterfalls in the vicinity of Killarney. The following are some of the principal English and Welch stations.

BRECKNOCKSHIRE. — Mr. Ralfs informs me it is common among the mountains in this county.

CAERNARVONSHIRE. — As far as I am able to decide I should say that the habitats at Snowdon, Llanberis, Cwm Idwell, Nantfrangon, &c., although generally accompanied by the name of *tunbridgense*, belong exclusively to the present species. I formerly supposed I had found *tunbridgense* in Caernarvonshire, but, on referring to the specimens, can only find the present species, which is most abundant on rocks and stones throughout the Snowdon district, at Rhaiadr-y-Wenol, Falls of the Lugwy, Capel Cerig, Rhaiadr-Mawr near Llanberis, &c.

CARDIGANSHIRE.—Mr. Lees has observed it in some quantity on rocks close to Pont Bren, or the Parson's bridge.

Cornwall. — Miss Warren has found it at Granite tor; Mr. Ralfs and Mr. Greenwood at Carn Brea, near Redruth; Mr. Babington and Mr. Borrer in abundance at Rough tor, near Camelford.

Cumberland.—Mr. Watson gives me Scale-force as a locality; Mr. Pinder speaks of it as of common occurrence on the rocks and screes; in addition to Scale-force, he mentions Scaw-fell, High-still, Honister-crag, Gatesgarth-dale, Borrowdale, &c.

Devonshire. — The Rev. W. S. Hore and Mr. Ward inform me it occurs in company with *H. tunbridgense*, on rocks and large blocks of granite adjoining the Plym, above Shaugh bridge, and Mr. Hore adds, in much greater abundance at Westman's wood, Dartmoor; Mr. Ralfs and Mr. Borrer have also found it on ravines at Dartmoor; and Miss Griffiths at Tynemouth, North Devon, and Bishleigh wood, South Devon.

Lancashire. — Miss Beever and Mr. Pinder have found it on the Old-man mountain; Mr. Sidebotham sparingly in caves at Greenfield; Mr. Simpson commonly near Lancaster; Dr. Wood on hills near Bury; and Mr. S. Gibson at Thevilly, near Burnley.

Merionethshire. — I have observed it in abundance at Rhaidr Du near Maentwrog, and at Rhaidr-y-Mawddach near Llaneltyd; and Mr. H. C. Rothery found it, in company with *H. tunbridgense*, in the vale of Festiniog.

Staffordshire. — Mr. Garner, in his 'Natural History of Staffordshire,' states that it has been found in the clefts of rocks at Gradbitch, near Flash.

Westmoreland.—Mr. Bowerbank observed it on Ambleside; Miss Beever has found it at Stock gill and Dungeon gill; and Mr. Pinder speaks of it as not uncommon in the county.

Yorkshire. — Mr. Gibson informs me he has found it at Turner's clough, seven miles from Halifax, on the Oldham road; Mr. J. Backhouse, jun., on rocks near Lower Harrogate; and Mr. Wilson near Greenfield.

In Scotland this species is more abundant than the preceding.

Argyleshire. — Mr. Babington has met with it at Crinnan, and Mr. Adamson at Dunoon.

Dumbartonshire. — Mr. Gourlie has met with it abundantly on rocks on the banks of Loch Lomond.

Dumfriesshire. — It has been found by Mr. Babington and Mr. Cruickshank in Girpel lane, Kirkpatrick juxta.

Perthshire. — Mr. Gourlie and many other botanists have found it on Ben Lawers.

Renfrewshire.—Mr. Gourlie has found it on rocks and hills above Gourock.

Shetland Isles.—Mr. Edmonston says, "I have observed it in one place overhanging a subalpine stream near Ska, Unst, in great luxuriance and abundance."

In Ireland this fern is much more common than in England, and grows with a beauty and luxuriance that I have not witnessed elsewhere: it is more generally distributed over the island than *tunbridgense*. I subjoin a few localities.

Antrim. — Mr. W. Thompson thinks that this is the species noticed in Mr. Templeton's MSS., under the name of *H. tunbridgense*, as having been found by him in Colin glen, near Belfast: at the time the record was made the name *tunbridgense* was applied to both species. Mr. Templeton also found it by the Glenarve river, near Cushendall.

Cork.—Abundant in the glens near Youghal.

Donegal. — Mr. Templeton found a *Hymenophyllum* on the Ennishowen mountains, which Mr. W. Thompson believes to be this species.

Down. — Mr. W. Thompson informs me he has collected this species in Tullamore park, and on the Mourne mountains.

Fermanagh. — Mr. W. Thompson informs me that the Hon. J. L. Cole has found this species near Florence court.

Galway. — Mr. Mackay has found it in Cunnemara, and I have seen specimens from Marm, Roundstone and Oughterard.

Kerry. — On rocks among the Kerry mountains, and at all the waterfalls about Killarney in profusion; and I almost invariably found it intermixed with *tunbridgense*.

Londonderry.—Mr. Moore possesses specimens collected in this county.

Wicklow. — On many of the rocky hills and waterfalls in this county, at Glendalough, Hermitage glen, and Powerscourt waterfall.

The range of *H. Wilsoni* appears coextensive with that of

H. tunbridgense, it having been found in the most distant parts of the globe: Europe, Africa, New Holland, and South America.

There is a very good figure of this fern in Sowerby's 'English Botany.'*

With respect to the name, British authors seem agreed in calling it *H. Wilsoni;* but, numerous as are our descriptions, not one appears to me to describe the plant so accurately as that by Willdenow of *H. unilaterale:* this I have quoted below,† and I think few botanists will hesitate in deciding that it was intended for a species very similar to our *H. Wilsoni.* I have never seen authentic specimens of Willdenow's plant, and therefore fear to adopt the name; moreover, Willdenow does not mention his *unilaterale* as an inhabitant of Europe. The subject is, however, well worth investigation; for, much as I honor the name of Wilson, I should not hesitate to adopt the prior name could it be established that the species were identical.

The species as British was first distinguished from the preceding by Mr. Wilson, who, in a letter to me, observes, "I have had considerable difficulty from the very first in procuring for *Hymenophyllum Wilsoni* an exact description: the pinnæ are not pinnatifid, as in *H. tunbridgense*, but more properly of a lobed or triangular form (rhomboid in the other species). It may perhaps aid the illustration to say that *H. tunbridgense* has the pinna with a central axis, while nothing of the sort can be dedected in *H. Wilsoni;* and that if you were to cut away the outer half of the pinna of *H. tunbridgense* you would then reduce it to the shape of *H. Wilsoni.* By this character the species may be recognised in a barren state." The first

* Eng. Bot. Supp. 2686.

† Hymenophyllum unilaterale, *W.* H. frondibus pinnatis, pinnis digitato-pinnatifidis secundis, laciniis linearibus sub-bifidis serratis, soris supra axillaribus solitariis, indusiis integerrimis, rachi stipiteque teretibus glabris. W.

Caudex repens filiformis crassitie capilli. Stipes pollicaris capillaris teres glaber. Frons sesqui- vel bipollicaris pinnata, circumscriptione lineari-lanceolata. Pinnæ inferiores et superiores minores, intermediæ tri- vel quadri-lineares digitato-pinnatifidæ glabræ secundæ. Laciniæ lineares indivisæ vel bifidæ obtusiusculæ serratæ. Rachis teres glabra. Sori supra-axillares *sessiles*. Indusia oblonga obtusa integerrima.—W. Sp. Pl. v. 521 (1810).

description of *H. Wilsoni* is from the pen of Sir W. Hooker. He describes it thus, "Fronds rigid pinnate, pinnæ recurved subunilateral wedge-shaped and 4—6 lobed, the segments linear undivided or bifid spinuloso-serrate, involucres axillary solitary ovate inflated entire, rachis only slightly margined towards the extremity;" * and he distinguishes it from *H. tunbridgense* in the following manner, "More rigid and with larger reticulations than the last, quite distinct in its mode of growth, for all the pinnæ are strongly curved backwards in a direction contrary to that of the fructification, the involucre is totally different larger browner of a more rigid texture truly ovate, each valve remarkably convex for its whole length, the edges only of the valves being applied to each other, and they are quite entire."†

The roots and rhizoma of *Wilsoni* offer no characters by which I can distinguish them from those of *tunbridgense;* the fronds of both are circinate; they make their appearance late in the summer months, and usually remain green through the winter, turning completely black in the ensuing spring.

The frond consists of branched veins, clothed with a membranous wing, the margin of the wings being serrated: the wing on the main stem is less apparent in *Wilsoni* than in *tunbridgense;* the pinnæ are always convex above, while those of *tunbridgense* are usually flat: *Wilsoni* has a more erect habit, *tunbridgense* a more horizontal, and, indeed, somewhat drooping, so that, on the trunk of a tree, the fronds seem to rest one on another like the tiles of a house. The involucre is very different from that of *tunbridgense;* it is elongate, swollen at the base, and its exterior margin perfectly without serratures: when the capsules are mature, the involucre opens at the top, and, splitting down the middle, remains widely gaping.

A comparison of the two illustrations, which are drawn with considerable care, will enable the botanist to form a more correct idea of the difference between them than I am able to convey by any description: they are of the natural size, the detached pinna of each being magnified.

In treating of species so closely resembling each other, and

* Brit. Flor. 446. † Id. l. c.

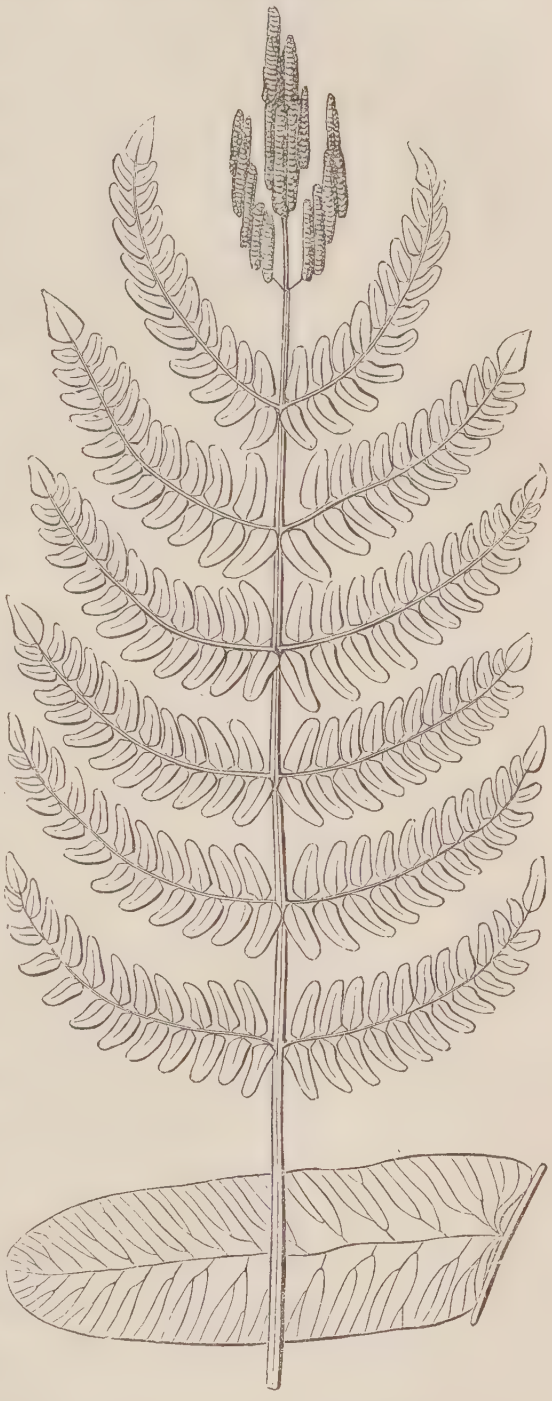
so long considered identical, as the two British *Hymenophylla*, we are bound to exercise the greatest caution, as well as candour. We must on no account draw our conclusions from mere appearances,—from isolated or ill-established facts,—or from assertions made either at random or by incompetent observers. I have peeled the matted rhizomata of these ferns from the rocks about Killarney,—have sat me down on the trunk of a fallen *Arbutus*, — have taken the mass of *Hymenophyllum* on my knees, and have carefully endeavoured to disentangle the tortuous wiry rhizomata of the two species. I have found every *appearance* in favor of the supposition that both forms of frond were produced by a single plant: the mat or carpet before me has appeared principally to consist of *tunbridgense*, but in every part rose the more erect fronds of *Wilsoni*, with their unilateral and secund *pinnæ:* still the evidence of continuity between the rhizoma that produced one form, and that which produced another, was always wanting; and on the same rhizoma, however carefully disentangled, I never found the two forms of frond. Candour also is essentially requisite: we must allow no theory, no previously conceived idea, no dictum of the learned, to influence us in what is simply an enquiry after truth. The opinion of a Linneus, a Willdenow, or a John Smith, may raise, but cannot solve, a question of this kind. The test to which I have before had recourse — that of comparison in the most perfect or fruitful state — yields its evidence in favor of the two forms being distinct as species. I have already observed that the great difference between them exists in the fructification, and I may also add that the more mature, the more perfect, the more fruitful the specimens, the greater are the discrepancies they exhibit, and the more decidedly and strikingly do they recede from each other.

FLOWERING FERN, (*fructification only, natural size*).

Osmunda regalis, Linneus.

This noble fern is so generally distributed over the British Islands that I forbear from publishing the immense list of localities with which I have been furnished through the kindness of correspondents. In Ireland, particularly in Connaught, it is most abundant: in Cunnemara I have often observed it covering the small islands in the lakes with a dense mass of its luxuriant fronds, those in the centre being more erect, those round the margins more pendulous. Of the pendulous habit I noticed a beautiful instance at Killarney, where it completely fringes the river between the lakes, and certainly forms a most prominent feature in that lovely but neglected portion of Killarney's far-famed scenery. So altered is the usual character of this fern, that its long fronds arch gracefully over, and dip their masses of seed in the crystal water, while the saucy coots, from beneath the canopy it affords them, gaze fearlessly on the visitors who are continually passing by. One of the boatmen employed by Sir Walter Scott, on the occasion of his visit to Killarney, told me that Sir Walter scarcely uttered a syllable in praise of the scenery until he came to this spot; and here he stopped the rowers, and exclaimed, "*This* is worth coming to see!" The boatman evidently thought very meanly of Sir Walter's opinion, whom he considered in duty bound to be in raptures with the lakes and mountains. I do not wonder at the great man's taste: to me it appeared the most wonderfully beautiful spot I had ever beheld, and this beauty is mainly owing to the immense size and number of these pendant fronds. In the Island of Achill it often fringes the little streams which descend from the mountains, rarely however rising above their water-worn channels, and thus escaping the violence of the mountain winds: in a sheltered farm in the possession of Mr. Long it has forsaken these water-courses and established itself in the fields, where he found it a troublesome weed, and very difficult to eradicate. I was amused to see it towering over his cabbages and potatoes, and intermixed with his oats and wheat. In Scotland this beautiful plant is also common, and often grows to a gigantic size:

on the banks of Loch Fyne, where its habit is comparatively rigid and erect, as represented in the accompanying figure, I have measured fronds eight feet in length. In the bogs of Lancashire it is abundant but less luxuriant, and it occurs not uncommonly in all the northern counties of England; it is also of frequent occurrence in North and South Wales, Cornwall and Devonshire, and is scattered in hundreds of localities throughout the southern counties approaching the vicinity of London, on Epping forest, and Keston heath.



Gerarde says "it groweth in the midst of a bog at the further end of Hampsted heath from London, at the bottome of a hill, adjoyning to a small cottage, and in divers other places, as also vpon divers bogges on a heath or a common neere vnto Bruntwood in Essex, especially neere vnto a place there that some have digged to the end to finde a nest or mine of gold; but the birds were ouer fledge, and flowne away before their wings could be clipped."*

In the eastern and midland counties it may be considered more rare. The following remarks on the distribution of *Osmunda regalis* are from the pen of Mr. Watson. "Here the distribution of an order is that of a single species only, the *Os-*

* Ger. Em. 1132.

munda regalis, which prevails chiefly in the south-west of England, and perhaps the south-west of the Highland tract; being very frequent on the coasts of Cornwall, and occurring in plenty about some of the lochs of Argyleshire, and on adjacent islands. The range of the *Osmunda* extends the whole length and breadth of Britain; but whether it be found on the islets north of Sutherland, or west of Islay, is yet unknown. Still, there are considerable tracts along the eastern side of England and Scotland, where it is either extremely scarce or wholly wanting. The *Osmunda* differs from most of the dorsiferous Ferns in being adapted to thrive in marshy places, and to flourish on the sea shores, sometimes only just above high water line. Notwithstanding that it endures the boreal climate of Sutherland, (a county in which the specimens are said to be small), the *Osmunda* is perhaps never seen much above the sea level in England, although the general vegetation of the coast in Sutherland approximates closely to what is observed at 1000 or 1200 feet of elevation in England. In respect to frequency of occurrence, the *Osmunda* may rank nearly on the level of its allies, the *Botrychium* and *Ophioglossum*, though rather less frequent than either of these."*

It is a species of common occurrence throughout Europe; and a plant very similar, and generally bearing the same name, is found in the United States of North America.

There are good figures of this fern in Bolton,† in Sowerby's 'English Botany,'‡ and in Hooker's 'Flora Londinensis,'§ besides many of the continental works.

All authors appear to be agreed in adopting the name of *Osmunda regalis:* the word *Osmund* is supposed to be derived from the Saxon *mund*, signifying strength: the rhizoma, when cut through, has a whitish centre or core, called by old Gerarde in his Herbal "the heart of Osmund the Waterman:" my lore is insufficient to furnish my readers with the history of the said Osmund.

Its medicinal properties are not noticed in Ray's 'Synopsis;'

* Analysis, 11. † Bolt. Fil. tab. 5. ‡ Eng. Bot. 209.
§ Flor. Lond. 150.

indeed they are seldom alluded to by the older botanists: we are, however, favored by Gerarde with the following particulars. "The root, and especially the heart or middle part thereof, boyled or else stamped, and taken with some kinde of liquor, is thought to be good for those that are wounded, dry-beaten and bruised; that have fallen from some high place: and for the same cause the Empericks do put it in decoctions, which the later Physitians doe call wound drinkes: some take it to be so effectuall and of so great a vertue that it can dissolue cluttered bloud remaining in any inward part of the body, and that it also can expell or drive it out by the wound."*

The roots are strong and fibrous: the rhizoma is tufted, and very large, as might be anticipated from its capacity of annually producing such a weight of foliage: this rhizoma, in marshy situations, and when shaded by alders and other trees, rises full two feet above the surface of the ground, exhibiting an appearance somewhat like that of the tree ferns. The young fronds, varying in number from six to twelve, make their appearance in May, arrive at maturity in August, and are destroyed by the first frosts of winter; their growth is remarkably rapid and vigorous, and, until nearly full grown, they have a reddish colour, like the shoots of many herbaceous plants. The fronds are fertile and barren.

The fertile frond is linear and pinnate: the pinnæ are four or five pairs in number, generally opposite, linear, and pinnate; the pinnules are linear, generally alternate, stalked and rounded at the apex, with the exception of the apical pinnule, which is more acute. The apex of the frond is composed of a compact cluster of spikes; these spikes correspond to pinnules, of which only the midvein and a slight marginal wing is present, and to each of the lateral veins is attached a nearly spherical cluster of capsules; these clusters entirely supersede any leafy portion in pinnæ so converted; frequent instances, however, exhibit the apex of a pinnule in a leafy or barren, while the base is in a fertile state. In an early stage of the frond these spikes appear crowded and pressed together, as represented at page 333, but

* Ger. Em. 1132.

they soon become more lax and diffuse, and at last entirely lose their rigid compressed appearance.

The barren frond differs in having the leafy portion continued to the very apex, where it terminates much as in the true ferns. The venation in a barren pinnule is shown at page 333, where it will be seen that the lateral veins branch alternately from the midvein, soon after leaving which, each is forked, and one or both of the branches are usually again divided, and all the branches run in parallel lines to the extreme margin of the pinnules.

MOONWORT, (*natural size*).
BOTRYCHIUM LUNARIA, Swartz.

The Moonwort has a very extensive range in Great Britain; but it may be said, both of this and the following species, that from their diminutive size they frequently escape that notice which *Osmunda*, from its conspicuous appearance, can by no possibility elude. Its chief stations may be given as in Staffordshire, Surrey and Yorkshire in England, and Antrim in Ireland; but it is more or less generally distributed over the whole of the British Islands, including the Isles of Wight, Orkney and Shetland. It affects those dry open heaths, elevated pastures and waste lands, which are generally shunned by other ferns, with the exception of the Common Brakes. I know of one instance only of its occurrence in a wood: this is mentioned below, and from its rarity becomes exceedingly interesting. The list of localities I subjoin is useful in showing its extensive range, and may perhaps guide the botanist to some stations before unknown to him; but it is presented to the reader under a full knowledge of its imperfections, since a complete list of localities would be far too voluminous for the present work.

The principal English and Welch stations are as under.

Anglesea. — "Not rare in old pastures: Rev. H. Davies." —*Botanist's Guide.*

Bedfordshire.—"Oakley West Field: Abbot."—*Botanist's Guide.*

Caernarvonshire.—"On Penmaen Mawr: Ray."—*B. Guide.*

Cambridgeshire.—"In Little Linton Warren: Chippenham, gravel-pits on the outside of the park near the gate; near Balsham."—*Relhan's Flora Cantabrigiensis.*

Cheshire.—Mr. Wilson has observed it in this county, near Over, where it attains a great size, and is often branched; Mr. Watson informs me it was found near Alderley edge by the Rev. Isaac Bell; Mr. S. Thompson that it was observed by Mr. H. E. Robson on the sand hills between Egremont and New Brighton. Dr. Wood says, "When botanizing near Over with my valued friend Mr. Wilson, in June, 1842, I met with some singular deviations in this interesting plant; one specimen had no less than four fertile branches and two barren ones, springing from a common stem; on several of the pinnules of the barren

frond were a number of thecæ, some on their plain surface, others on their edges; many specimens had two fertile fronds generally of unequal size: they were growing in a meadow on a small declivity, in company with *Habenaria chlorantha*." — *Phytologist.* "Fields about Hooley's Folly, near Macclesfield: Mr. Bradbury."—*Botanist's Guide.*

CORNWALL.—Mr. Ralfs informs me it has been found by Mrs. Grylls near Cardynham.

CUMBERLAND. — I have seen specimens from Giggleswick, Newly cross, Daleton and Flimsby. "Keswick, in a field on the right of the road to Penrith: How Hill; Castle Sowerby; and Naworth Park, rare: Hutchinson. In a field of Mr. Allison's near Aspatria: Rev. J. Dodd. Sea dike between Workington and the Coin House: Rev. J. Harriman."—*Botanist's Guide.*

DENBIGHSHIRE. — "Old pastures west of Chirk castle: Mr. Griffith." — *Botanist's Guide.* "Near Wrexham: Mr. J. E. Bowman."—*Francis' Analysis.*

DERBYSHIRE. — Mr. Pinder finds it on the borders of this county, towards the town of Sheffield; Mr. Watson on a hill near Buxton; Mr. Hattersley on the road side between the High Peak and Sheffield, very fine and abundant. "Dethick: Mr. Coke. Chinley Hill, near Chapel-le-Frith: Mr. O. Sims. Heights of Abraham, behind Matlock bath."—*Botanist's Guide.*

DEVONSHIRE. — Miss Griffiths informs me it has been found by Mrs. Griffiths, near the Dart, in this county; and also on Haldown hill by Messrs. Luccomb and Pince's gardener. "Near Barnstaple."—*Francis' Analysis.*

DORSETSHIRE. — "In the meadows near Sturminster Newton: Pulteney."—*Botanist's Guide.*

DURHAM. — "Fields near Marsden rocks, and moor above Beamish."—*Winch's Flora of Northumberland and Durham.*

HAMPSHIRE. — Dr. Bromfield informs me it occurs, though rarely, on dry hilly pastures and shady woods in the Isle of Wight. In the deepest and shadiest recesses of the rough rocky wood at East end, between Shanklin and Bonchurch, amongst dead leaves, in considerable plenty, on the 12th of June, 1841. I have seen specimens from Harting Combe, near Petersfield, in this county.

HEREFORDSHIRE.—"Northern parts of the county: Duncumb." —*Botanist's Guide.*

KENT. — Mr. H. L. Jenner informs me he has found it near Dartford. "In Scadbury park and on Chiselhurst common: Sherard."—*Botanist's Guide.* "South Kent: Rev. G. E. Smith." —*Francis' Analysis.*

LANCASHIRE. — Mr. Gibson gives me Chilburn, near Todmorden, as a locality; Mr. Wilson, the vicinity of Newton and Southport; Mr. Sidebotham, Oldham and Reddish; Mr. Simpson, Lancaster; Mr. Watson, a common between Bootle and Crosby; Dr. Wood observes that it is a common plant on the hills in the vicinity of Manchester, and Mr. Merrick has found it at Greenfield, near the same town.

LEICESTERSHIRE. — "Closes between Okeley wood and Long Whatton, near Loughborough; meadows by Swarston bridge, near Ashby de la Zouch; about Market Harborough: Pulteney." —*Botanist's Guide.*

LINCOLNSHIRE.—"Lincoln heath: Blackstone." — *Botanist's Guide.*

MONTGOMERYSHIRE.—"Near Rodney's Pillar: Rev. A. Bloxam."—*Francis' Analysis.*

NORFOLK.—Mr. S. P. Woodward informs me it grows on Heveringham heath. "Stratton heath: Mr. Crowe. At Seething: Mrs. Kett. On Moushold Heath, near Norwich: Mr. G. Smart. Berg Apton: Mr. Woodward."—*Botanist's Guide.*

NORTHAMPTONSHIRE. — "Higher parts of the Would field; and on Halston heath: Morton."—*Botanist's Guide.*

NORTHUMBERLAND. — "Rocks near Shewing Shields." — *Winch's Flora of Northumberland and Durham.*

NOTTINGHAMSHIRE. — I am indebted to Mr. Sidebotham for specimens from Clifton cow-pastures, in this county; Mr. Riley has found it near Papplewick. "Eastwood: Deering."—*Botanist's Guide.*

OXFORDSHIRE.—"On the south side of Shotover hill; North Leigh heath: Sibthorpe. Three miles from Oxford, near the blind Pinnocks: Merrett. In several parts of Winchwood forest: Blackstone."—*Botanist's Guide.*

SHROPSHIRE. — I am indebted to Mr. Jerdon, of Bewdly, for

living specimens procured near Stollerton; and Mr. Westcombe informs me he found it on Titterstone Clee hill. "Meadow near Ludlow: Dr. Evans."—*Botanist's Guide.*

Somersetshire.—Mr. Flower has found it near Bath, and at Shirehampton, near Bristol, sparingly in both places; and Mr. Babington informs me that Dr. Alexander found it in a field between the lane leading from Bath to Claverton and the farm-house on the down. I have seen specimens from Kingsweston hill. "Commons and waste lands in divers parts of the county."—*Botanist's Guide.*

Staffordshire.—Mr. Pinder informs me he has found it in this county; and Mr. Carter that he has observed it on Cheadle common, and also growing very luxuriantly by the side of a lane leading from the common to Great gate, several of the plants measuring nine and eleven inches from the crown of the root to the extremity of the spike; Mr. Carter adds, "In an elevated pasture, about two miles beyond Farley, I observed thousands of this fern."

Suffolk.—I learn from Mr. Stock that it has been gathered near Bury. "Chalk-pits near Bury: Sir T. G. Cullum."—*Botanist's Guide.*

Surrey.—I am indebted to Mr. Hanson, of Reigate, for living specimens procured in Reigate park, where it was first found by Mr. Luxford, as recorded in the 'Reigate Flora.' Mr. Salmon informs me that it occurs on Highdown heath, near Godalming. It is remarkably abundant in the vicinity of Shire and Albury; and Mr. Jenner informs me it grows in great profusion near Abinger, the seat of the late Lord Abinger. Mr. Luxford has found it at Bury hill. I have seen specimens from Coulsden and Shirley commons, also from Leith hill, where it has been found by Mr. Pamplin. "Deep Dean, near Dorking: Rev. J. Nash."—*Francis' Analysis.*

Sussex.—Mr. Borrer informs me it occurs in some plenty in this county, both on gravel and on chalk; he has observed it near Patcham, &c. &c.; the late Rev. F. Fearon gathered it near Storrington; Mr. Jenner has found it on the forest near Croboro Warren, Dudsland, near Cross-in-hand, Waldron, Burwash common, in several localities on the South Downs, on Boxgrove

common, near the east entrance of Parham park, &c. &c. "Hollingbury hill: Mr. Borrer. Mountainous pastures near Stoneland: Rev. Mr. Bale."—*Botanist's Guide.*

Warwickshire. — Mr. G. W. Perry has observed it in Warwickshire; Mr. Murcott has observed it on heathy ground near the upper part of Coleshill bog, on the Stonebridge side.

Westmoreland.—Mr. Pinder has found it in Westmoreland; Mr. Hindson has gathered it at Rigmaden.

Wiltshire. — Mr. Babington informs me he observed it near Bath, within the limits of Wiltshire. "Alderbury common: Dr. Maton."—*Botanist's Guide.*

Worcestershire.—Mr. Lees gives me Abberly hill as a locality, on the authority of Mrs. Phipps Onslow, from whom he has received a specimen. I have seen specimens from Oversley hill, about a mile from Alcester. "On the south side of Breedon hill, in many places: Nash. On coal-pit banks near Stourbridge: Mr. W. Hill."—*Botanist's Guide.*

Yorkshire. — Mr. Babington informs he has found it on Cronckley fell; Mr. Pinder that it is abundant near Preston, Kippar, Leeds, Brightside, and Sheffield; Mr. Tatham that it is common, and in some places — as Tarnfield pasture — very abundant near Settle; Mr. S. Gibson finds it at Midgley moor; Mr. Watson has received it from the neighbourhood of Halifax, where, according to Bolton, a variety occurs with leaves shaped like a lady's fan when fully expanded, divided by narrow sections running almost down to the base, into four or five lobes, which are deeply crenated at their extremity; Mr. Hardy says it is widely distributed in the Sheffield district; Mr. Spruce has given, chiefly on the authority of Mr. Backhouse, the following localities,—Ganthorpe near Castle-Howard, Coneysthorpe, Terrington car, Knavesmire near York, wood near Earswick and Low Harrogate; Mr. Baines, in his 'Flora of Yorkshire,' gives Airy holme near Hovingham, Moor-riggs in Teesdale, Cotherstone fell, Hambleton hills, Whitby, vicinity of Knaresborough, of Richmond, &c.; and in the 'Botanist's Guide' we find Leeds, Copgrove, Ripon, Richmond race-course, Scawton, &c. &c., recorded as localities.

In Scotland it seems a plant of by no means uncommon

occurrence in similar localities ; indeed from the greater preponderance of elevated pastures the stations are more numerous, and I believe also less distant from each other than in England. I have ascertained those enumerated below.

ABERDEENSHIRE.—" Dr. Murray."—*Francis' Analysis.*

ARGYLESHIRE.—Mr. Gourlie has found it at Rothsay in Bute.

BERWICKSHIRE. — " Bernerside hill : Mr. W. Baird."—*Francis' Analysis.*

DUMBARTONSHIRE.—Mr. Gourlie informs me it has been found by Mr. G. Gardner at Mugdock.

DUMFRIESSHIRE.—Mr. Cruickshank informs me he has found it at Drumlanrigg.

EDINBURGHSHIRE. — I learn from Mr. Watson that he has found it on the Pentland hills.

FORFARSHIRE.—Mr. Watson informs me he has collected this plant on the Clova mountains.

KIRKCUDBRIGHTSHIRE. — Mr. Cruickshank informs me that Mr. Gray has found it near Glen mills, in this county.

LANARKSHIRE—Mr. Gourlie has found it on the Cathkin hills.

MORAYSHIRE. — The Rev. G. Gordon gives it as a native of Moray.

NAIRNSHIRE.—I have seen specimens from near Auldean.

PERTHSHIRE.—Mr. Gourlie has found it on Ben Lawers ; Mr. Watson on the south side of Loch Tay, and on Craig-Challiach ; Mr. Brand in Blair Athol ; and Mr. Wilson also informs me he has observed it on the mountains in this county.

RENFREWSHIRE.—Mr. Gourlie informs me he has found it on the hills above Gourock.

WIGTONSHIRE.—Mr. W. Thompson informs me that the Rev. Mr. Umquhart has found *Botrychium* near Portpatrick.

ORKNEY ISLANDS. — The Rev. C. Clouston mentions *Botrychium* as a native of Orkney.

SHETLAND ISLANDS. — Mr. Edmonston informs me that it occurs on most of the dry hills in Shetland ; Ugasound, Unst, Ollabury, Northmarm, &c.

I have received, principally through the kindness of Mr. W. Thompson, the following Irish localities.

ANTRIM. — From Mr. W. Thompson I learn that in the late

Mr. Templeton's MSS. several Antrim localities for *Botrychium* are recorded; some of these are scarcely above the level of the sea, and others have an elevation of nearly 1000 feet: Mr. Templeton observes that "about the Roughfort it is as plentiful as grasses or other foliage." Mr. Thompson observes that he has not seen it in all the localities discovered by Mr. Templeton, but that it is common in the mountain pastures about Belfast, and he has met with it at Altmore glen, near Cushendall.

Down.—The late Mr. Templeton has recorded Scrabo in this county as a locality.

Londonderry. — Mr. Moore showed me specimens from the Benyvena mountains, near Magelligan.

Wicklow. — From Mr. W. Thompson I learn that the late Mr. Templeton found it on the lawn at Luggelaw, and in the Powerscourt demesne.

The Moonwort is found throughout Europe; and a very similar species — some botanists consider it identical — throughout North America.

The figure of this plant in Sowerby's 'English Botany,' * under the name of *Osmunda lunaria*, gives a correct idea of its appearance, but that in Bolton's 'Filices,'† under the same name, is decidedly bad.

The genus *Botrychium* was divided by Swartz from the Linnean genus *Osmunda*, and has been adopted by nearly all subsequent botanists. The Linnean specific name of *lunaria* has remained unchanged.

It is rather amusing than instructive to read the virtues ascribed by Dioscorides, and other ancient writers, to nearly the whole family of ferns. Of the present species much has been written, and the most wonderful magical properties have been assigned to it. This we may trace, in a great measure, to the singular form of the pinnæ: all those plants whose leaves bore even a fancied resemblance to the moon — and the name clearly implies that this was the case in the present instance — were formerly regarded with a most superstitious veneration. From all record we find that they were to be gathered by the light of

* Eng. Bot. 318. † Bolt. Fil. tab. 24.

the full moon, or half their powers would be lost. In the present day such fancies are entirely confined to works of the imagination.

> Then rapidly, with foot as light
> As the young musk roe's, out she flew,
> To cull each shining leaf that grew
> *Beneath the moonlight's hallowing beams.*

Again —

> And the *white moon-flower*, as it shows
> On Serendib's high crags, &c.

Gerarde says it "is singular to heale green and fresh wounds: * * * it hath been vsed among the Alchymists and witches to doe wonders withall, who say that it will loose lockes, and make them to fall from the feet of horses that grase where it doth grow, and hath been called of them Martagon; whereas in truth they are all but drowsie dreames and illusions; but it is singular for wounds as aforesaid." * Both Gerarde and Ray† speak of its virtues as a remedy for dysentery.

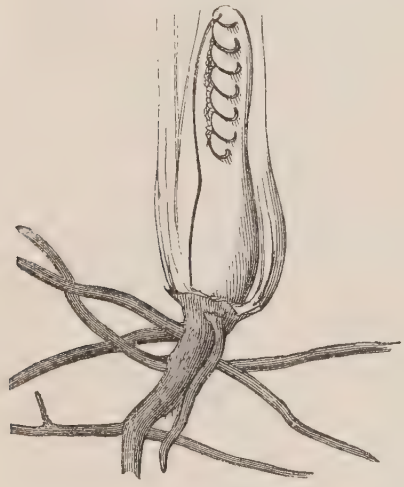
The roots and rhizoma of *Botrychium* differ essentially from those of true ferns; the root is stout, succulent and brittle; the rhizoma appears to be nothing more than the base of the stem, scarcely distinguishable by any increase of substance: a single main root descends perpendicularly, and other roots issue from this at right angles, principally at two points, but without any positive uniformity in this respect.

Before the plant has felt the influence of spring, the frond exists in a quiescent state, but perfectly formed; it appears like a simple stem, scarcely an inch in length, and perfectly erect; on a closer inspection the component parts of the future frond will be clearly perceived; the lower portion or rachis is considerably stouter than the upper part, the two portions of which face each other, the seed or fertile portion of the frond being clasped by the barren or leafy part; and, the fructification being thus en-

* Ger. Em. 407.

† Ex Lunaria Walli unguentum conficiunt, quod regioni renum illitum habetur inter certissima dysenteriæ remedia; D. Needham.—Syn. 129.

tirely concealed, the uppermost pinnæ are incurved, as if to give still further protection to the fruit. The whole is invested and completely enclosed in scale-like alternate sheaths, doubtless the decaying stalks of many previous years. As the spring advances the frond rapidly increases in size, until, in April, it makes its appearance above ground, and in May or June attains its perfect development. Mr. Wilson observed, as long ago as 1830, that within the stem of the growing frond, at its base, was enclosed the frond for the ensuing year, and again within this, at its base also, the frond for the next following year. Mr. Wilson having most kindly communicated to me this most interesting observation, I have, during the past spring, carefully examined an abundant supply of specimens, for which I am indebted to Mr. Hanson of Reigate; and I am thus enabled to give a magnified figure of one of these future fronds. I find the frond of the ensuing year in every respect perfectly formed; indeed exactly in the same state in which it is found in the early spring, as above described, but somewhat less. The frond for the next following year is less perfectly formed; indeed its component parts are not to be made out without some difficulty; still it is evidently bifid, the fruitful and leafy portions being already distinct from each other. These observations were made in May (1843), while the plant was still growing with apparent vigour, so that we have the fronds for three successive years before us at the same time. In the plants I examined the fronds were placed alternately; *i. e.* having laid all the specimens before me, with the fruit on the right hand and the leafy portion on the left; then the frond for 1844 invariably had the fruit on the left and the leafy portion on the right: the frond for 1845 appeared to be again reversed, having the fruit on the right and the leafy part on the left.



I must not conclude these observations without acknowledging the obligation I am under to Miss Beever, who, two years subsequently to my receiving Mr. Wilson's letter on the subject,

sent me specimens exhibiting the structure here described, and called my attention to many of the particulars I have noticed.

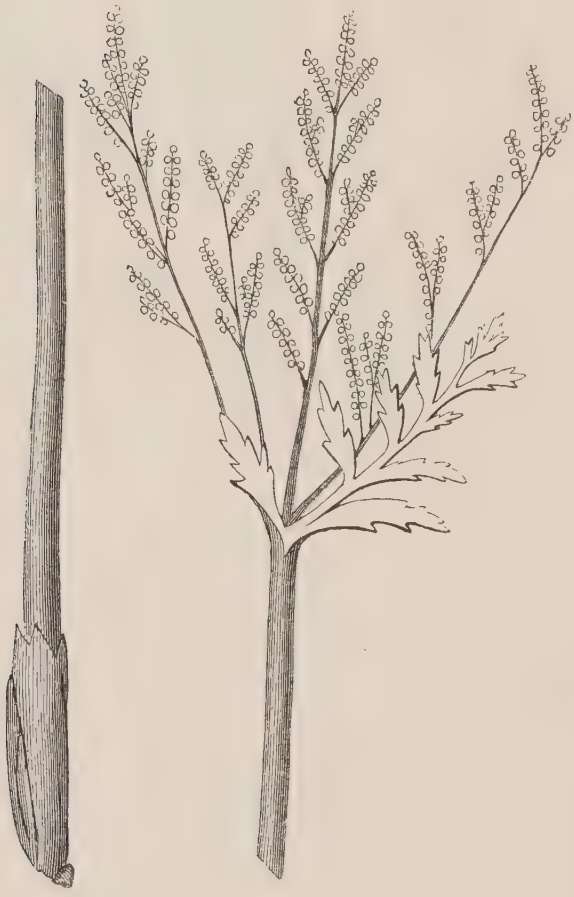
The stem is very succulent, and rises in an erect position from the sheath-like scales already spoken of, thus totally differing from that of the true ferns. It is divided at about half its length: one branch bearing the leafy portion of the frond, the other the fructification: the leafy portion is pinnate; the pinnæ vary in number from three to eight pairs; they are somewhat fan-shaped, with the exterior margin slightly crenate; the veins in these pinnæ are branched irregularly, and extend almost to the margin, but are never united at their extremities: the fruitful branch of the stem is pinnate, the pinnæ generally somewhat corresponding in number with those of the leafy branch: these lateral branches, or pinnæ, are frequently again divided, and bear a number of nearly globular capsules, which, having attained maturity, open transversely, and, gaping wide, allow the seeds to fall out.

Very remarkable varieties of this plant are occasionally met with; one of these, the *Lunaria minor foliis dissectis* of Ray,* has been treated by Swartz† and Willdenow‡ as a distinct species, under the name of *Botrychium rutaceum*. Three varieties are mentioned by Smith; of these, β. is the *Lunaria minor ramosa* of Ray,§ γ. is the *Lunaria racemosa minor adianti folio* of Breynius,‖ and δ. the *Botrychium rutaceum* already mentioned. Concerning these varieties Smith remarks, "β. has a branched stalk, bearing several leaves and compound spikes, alternately disposed; γ. is a very slight variety, with more jagged leaflets than ordinary; δ. has pinnatifid leaflets, and a more spreading habit. All these varieties, and perhaps others, are found occasionally intermixed here and there with the plant in its proper or common form; but never, as far as I could learn, so numerously distinct as to have the appearance of a different species."¶

I am indebted to Mr. Cruickshank for a drawing, faithfully copied on the following page, of a very singular form of the

* Syn. 129. † Syn. Fil. 171. ‡ Sp. Plant. v. 62. § Syn. 129.
‖ Breyn. Cent. t. 93. ¶ Eng. Flor. iv. 316.

plant. "I found it," says Mr. Cruickshank, "on the sands of Barry, near Dundee, in August, 1839. I observed but three specimens, all exactly alike, excepting a slight difference in size, and I could find none of the common form of the plant growing near them." I have not seen either of the specimens, and am unable to form from the drawing any conclusion as to the probability of their being specifically distinct.



ADDER'S-TONGUE, (*natural size*).

OPHIOGLOSSUM VULGATUM, Linneus.

THIS plant is generally distributed over England, and in many places is of very common occurrence, covering acres of meadow-

land, and being considered highly injurious to the crop of grass. In Wales, Scotland and Ireland, it is of less common occurrence, a circumstance perhaps attributable to the greater frequency in England of those low loamy pastures which it peculiarly affects. I have only on one occasion found it in a wood, and this was on the northern slope of West Hope hill, in Herefordshire ; here it was large and luxuriant, the apex of the frond elegantly turning back, and its appearance somewhat resembling that of the blossom of the Egyptian Arum. In Berrington park, in the same county, it occurs in the utmost profusion ; and from these stations I obtained the specimens from which I have drawn my figures. In reference to Ireland, Mr. Thompson says of *Ophioglossum*, "Templeton remarks that it is partial to moist loamy or clay soils, especially meadows liable to be flooded after heavy rains : he particularises a locality of this nature on the banks of the river Logan, about three miles from Belfast." Mr. Thompson, in company with Mr. Ball, found the Adder's-tongue in the South Isles of Arran, off Galway.

The Adder's-tongue is a common plant on the continent of Europe, and it is said to occur in Africa and North America; but I have been unable to satisfy myself of the identity of the species.

There are faithful figures of this plant in Gerarde,* Bolton,† and Sowerby's 'English Botany.'‡

All modern botanists appear to be agreed as to the name of *Ophioglossum vulgatum*.

The *virtues* of Adder's-tongue are not quite so numerous as one might expect from its singular name and appearance. Gerarde, Ray,§ and Lightfoot, extol its healing powers, the two former in oil, the last as an ointment. "Adder's-tongue," says Gerarde, "is dry in the third degree. The leaves of Adder's-tongue stamped in a stone morter, and boyled in Oile Oliue vnto the consumption of the juice, and vntill the herbes be dry and parched, and then

* Ger. Em. 404. † Bolt. Fil. t. 3. ‡ Eng. Bot. 108.

§ Vulnerarium est insigne tum intus sumptum, tum extrinsecus applicatum. Conficitur ex eo oleum, foliis cum oleo olivarum diutius maceratis, ad omnia vulnera et ulcera commendatissimum. Pulvis at ramices valet.—Syn. 128.

strained, will yeeld a most excellent greene oyle or rather a balsame for greene wounds, comparable to oile of St. John's-wort, if it do not farre surpasse it by many degrees ; whose beauty is such that very many artists haue thought the same to be mixed with verdigrease."* Lightfoot says the common people in Scotland "sometimes make an ointment of the fresh leaves, and use it as a vulnerary to green wounds :"† and Mr. Luxford informs me it is still gathered for the same purpose in some parts of Surrey and Sussex : and used under the name of Adder's-spear ointment.

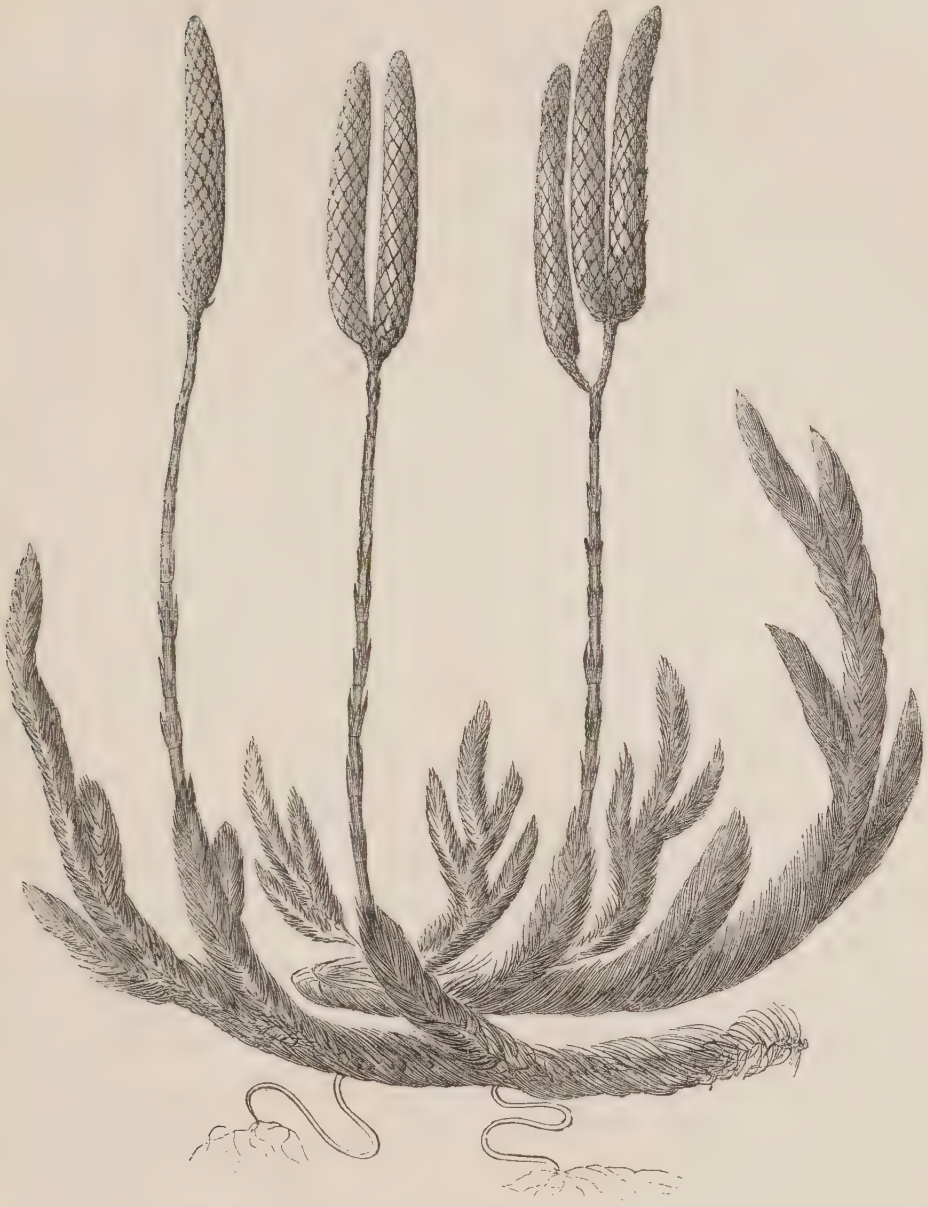
The roots and rhizoma of Adder's-tongue much resemble those of Moonwort ; but the rudimentary plant for the next year is exterior to the stem, and not enclosed within it as in the latter : a reference to the figure will elucidate this explanation. The roots are stout, succulent and brittle ; a main root descends a certain but not uniform distance, emitting various lateral branches at right angles ; the arrangement of these lateral branches is somewhat verticillate ; at the lower extremity of the perpendicular root, I have invariably found a single horizontal root of very considerable length, often as much as ten inches. I have procured large pieces of turf filled with these plants and their roots, and have carefully removed the earth, expecting to find an underground connection between the plants by means of these horizontal roots ; but though I constantly found them in contact, I never detected anything like union. The detached external bud at the base of the stem contains the frond for the ensuing year, in a perfectly erect position, and having the leafy part of the frond wrapped round the spike of fructification.

The frond comes above ground in May, still retaining its erect position ; it is composed of a long, smooth, pale-coloured, succulent stem, an ovate, rather acute, slanting, deep green leaf, and a straight erect spike, issuing from the inner base of the leaf. The leaf is traversed in every direction by irregular anastomosing veins. The spike is distinctly stalked, the stalk being sometimes three or four inches, but generally scarcely more than one inch in length. The spike itself is rather stouter at the

* Ger. Em. 405. † Flor. Scot. ii. 652.

base, very gradually tapering to the apex; it is composed of two series of large, imbedded, crowded, circular capsules; these capsules appear to be spherical cavities, filled with a pollen-like dust: when mature each capsule opens by a transverse fissure, the pollen-like dust escapes, and the lips of the capsules remain separate and gaping.

Instances of monstrosities occur in which two, three, four, five, and even six spikes issue from a single leaf.



COMMON CLUB-MOSS (*natural size*).

LYCOPODIUM CLAVATUM, Linneus.

THE Common Club-moss, Wolf's-claw, or Stag's-horn, is the only species of Lycopodium that can be spoken of as abundant in Britain. It occurs on most of our moors and heaths, especially when rather more elevated than the surrounding country; for instance, in the vicinity of London it is found on Hampstead Heath, High Beech, the Addington hills, &c. It is abundant on nearly all the mountains of the north of England, Wales and

Scotland, and is found occasionally, but less frequently, in similar situations in Ireland.

This Club-moss is a handsome and interesting plant. I have heard of a lady who had a ball-dress ornamented with its graceful festoons; and Linneus relates that in Lapland he saw the boys with their heads decorated with chaplets or wreaths formed of it, the double spikes projecting on all sides, a sight which reminded him of the fauns and satyrs: * and Tragus says that the girls in Germany make it into chaplets and belts.†

Old Gerarde has some remarks on the subject, which are so pleasant that I think my readers will not object to my quoting them at length. "There is another kinde of mosse which I have not elsewhere found than upon Hampstead Heath, neere unto a little cottage, growing close upon the ground amongst bushes and brakes, which I have shewed unto divers surgeons of London that have walked thither with mee for their further knowledge in simples, who have gathered this kinde of mosse, whereof some have made them hatbands, girdles, and also bands to tye such things as they have before gathered, for the which purpose it most fitly served; some pieces whereof are six or eight foot long, consisting as it were of many hairy leaves set upon a tough string, very close couched and compact together, from which is also sent forth certain other branches like the first: in sundry places there be sent down fine little strings, which serve instead of roots, wherewith it is fastened to the upper part of the earth, and taketh hold likewise upon such things as grow next unto it. There spring also from the branches bare and naked stalkes, on which grow certaine eares as it were like the catkins or blowings of the hasell-tree, in shape like a little club or the reed mace, saving that it is much lesser, and of a yellowish white colour, very wel resembling the claw of a wolfe, whereof it tooke his name, which knobby catkins are altogether barren, and bring forth neither seed nor floure."‡

* Vidi aliquando, grato spectaculo pueros Lapponum ex hos musco serta confecisse capitique suo eadem imposuisse, horrentibus undiquè spicis distichis, hirsutie Faunis et Satyris similes.—Flora Lapponica, 339.

† Virgines et serta et cingula ex hoc musco conficiunt.—Tragus, 554.

‡ Ger. Em. 1562.

It seems rather unaccountable that neither Gerarde, nor his able editor, Johnson, to whom, by the way, the great herbalist is indebted for the better half of his fame, should have so entirely overlooked the minute but multitudinous seeds, which have attracted the attention of so many other botanists. Olearius appears to have been the first to mention these seeds, and a curious purpose to which they have been applied. This author devotes the 24th chapter of the 4th book of his Itinerary, to the fire-works of Ardebil, a town in Persia; and he believes them produced by the seeds of this *Lycopodium*. He observes, "We saw at a distance some flames rise suddenly in the air, and as suddenly disappear, and we supposed them to be produced by the Russian *Plaun*, which is much used for this purpose. The *plaun*, to explain more fully, is nothing more than a yellow dust which is beaten out of the *Muscus terrestris*. The moss is called in herbals *beerlap** or *Devil's-claw*, and grows commonly in fir and birch woods, and also on waste lands: I have frequently met with it in the Russian and Livonian woods. It throws out twin cones, which, when ripe in August, are collected in large quantities and dried in furnaces; the powder is then beaten out and sold by the pound. I bought several ox-bladders full, and brought them home with me. Its other uses are in green wounds, recent bruises, and for chafed children, inasmuch as it is of a drying and healing nature; and it is moreover used by the Russians in the Chaldaic fire above spoken of. The powder is placed in a tin case, of elongate conical form, about half an ell in length, or sometimes shorter; this is taken in the hand, and a burning light or torch is placed at the aperture; the case is then waved about in the air, so that the *plaun* flows through the aperture, and then ignites, producing a bright flame: when the motion is rapidly repeated, so that one flame follows another, it produces a very extraordinary effect. Fine fun may be made in company, if a tobacco-pipe be secretly filled with this *plaun*, and held to the light and blown into; a strong flame, suddenly and unexpectedly to those sitting around, proceeds from it, and that it may produce a great noise they mix

* Tragus figures the plant under this name.

it with powdered birch-leaves. The plaun-powder has the property of igniting only when it is dusted through a flame in the air, and not otherwise, even if a torch or light be placed in it, or it be cast on live coals. In case the plaun is not to be obtained, finely powdered sweet-scented gum or rosin will answer the purpose, and this, besides the amusement, produces a pleasant smell. The plaun has no particular smell and produces no smoke."* Subsequent writers appear to have curtailed and garbled these interesting remarks, rather than verified them by their own observations.

In some of the chemists' shops of this country the seed of *Lycopodium* is kept as an article of sale; and Mr. Luxford, who has tried the experiment, bears ample testimony to its inflammable property. The demand for this article, as may be supposed, is extremely limited, yet a friend has informed me that he is acquainted with a chemist who has received an order for several pounds weight of it; the purpose for which this large quantity was required is unknown. Sir J. E. Smith says that the seeds are still sold in the shops in Germany for the purpose of producing artificial lightning on the stage:† this use must however be very limited, on account of the difficulty of procuring the seed in any quantity; and moreover, as mentioned above by Olearius, pulverised rosin is found to be a cheap and efficient substitute. I have lately been informed that these seeds, spread upon a plate of metal, have been employed in Chladni's lectures to illustrate the vibration produced by sound.

Many writers have said a good deal of the power of the powder or seed to repel water: it is certain that this property is observable after a fashion, if we scatter a quantity of the powder on a basin of water; when the surface is covered the finger may be partially immersed without becoming wet. This property has induced the manufacture of what has been called "the patent Lycopodium waterproof cloth," an advertisement of which must lately have attracted the notice of many botanists. I do not, however, presume to say that the fabric in question is improved by the use of *Lycopodium* seed, or even that *Lycopodium*

* Olearius, Itin. Muscovit. Persic. lib. iv. cap. 24. † Eng. Flor. iv. 318.

seed is employed in its manufacture; my knowledge of the subject being confined exclusively to the advertisement.

This plant has been figured by Tragus, Lobel, Tabernæmontanus, Cordus, Gerarde, John Bauhin, Plukenet, Matthiolus, Camerarius, Dillenius, &c., but with the exception of the figure by Dillenius,* none of them give a very accurate idea of the plant: of later representations, that in the 'Flora Danica'† is perhaps the best, but even this does not approach in accuracy or freedom of drawing the admirable figure by Dillenius.

The older botanists have generally called this species *Muscus terrestris*, or *Muscus clavatus:* Cordus terms it *Chamæpeuce*, or dwarf fir: and all writers since the establishment of the Linnean binominal nomenclature have agreed in naming it *Lycopodium clavatum*.

The medical properties of the Common Club-moss have been greatly extolled by our earliest writers. Tragus gives a flaming account of its virtues, the chief of which seem to be the removal of calculus by comminution, and the cure of gout;‡ Matthiolus,§ Camerarius,‖ Lobel,¶ Tabernæmontanus,** Ray,†† and Dillenius,‡‡ appear to have taken these virtues for granted, as they have copied them without hesitation. Ray indeed adds several others, and asserts that a decoction of its leaves was used in Poland as a cure for a disease called Plica, whence, he observes, the plant has been named *Plicarius;*§§ and John Bauhin, in addition to many other valuable properties, states that loose teeth may be fixed by washing the mouth with a decoction of the seed in red wine.‖‖‖ I am, however, inclined to think that

* Hist. Musc. t. 58, fig. 1. † Flor. Dan. 126.

‡ Vino decoctus ac potus calculos comminuit; * * nonnulli etiam aquam ex eo distillant, ad eadem affectionem. Muscus contusus aut in vino decoctus dolorem et inflammationem sedandi vim obtinet, ideoque podagræ calidæ impositus prodest.—Tragus, 555.

§ Matthiolus, Valgr. i. 57. ‖ Camerarius, Epitome, 32. ¶ Lobelius, 645.

** Tabernæmontanus, 1201. †† Ray, Hist. 120. ‡‡ Hist. Musc. 441.

§§ Apud Ruthenos et Lithuanos ad Plicam morbum gentibus illis endemium adhibitur, unde Plicarium et Cingularium eum nominant.—Syn. 107.

‖‖‖ In eodem [rubro] vino coctus, si eo abluatur os, tremulos dentes confirmat. —Hist. iii. 759.

its use in either of these capacities must have been much less extensive than its historians imagined; indeed, from certain references, it seems not improbable that many of its supposed virtues owe their origin to a passage in Dioscorides, on a plant which he calls *Muscus marinus*, and which, beyond all doubt, is one of the Algæ. Mr. Ward informs me that whatever may have been its pristine fame, it holds no place in the modern Pharmacopœia. Tragus observes that the Germans call the plant Weingrein, from its power of restoring injured wine.* The same observation is repeated by his successors.

Lightfoot, in his 'Flora Scotica,' says that the Swedes make mats of the Club-moss to rub their feet on; if this be true, it is remarkable that the fact should have escaped the notice of such observant men as Linneus and Wahlenberg, neither of whom makes the slightest allusion to the subject. Is it possible that Lightfoot has mistranslated the Swedish appellation of *Mattegräs*, a most appropriate name, simply equivalent to matted grass, and not at all implying its employment in the manufacture of mats?

The roots of this species are very tough, wiry, and pale in colour; they are generally nearly straight and simple for an inch or more, then suddenly divided and tortuous; they are usually placed singly and at rather long distances from each other, and do not penetrate deeply into the earth, but yet fix the creeping stem most firmly, and prevent any injurious action from the wind. It has been supposed that on lofty mountains this plant, forming as it does a compact matted turf, whence the Swedish name, serves to bind the surface of the soil more closely together, and thus secure it from the continued crumbling away, to which, in exposed situations, it is constantly liable, from the effects of wind and rain.

The stem is procumbent and repeatedly branched, the branches being at first slightly elevated, but soon becoming completely prostrate. It extends to a great length; I have frequently found

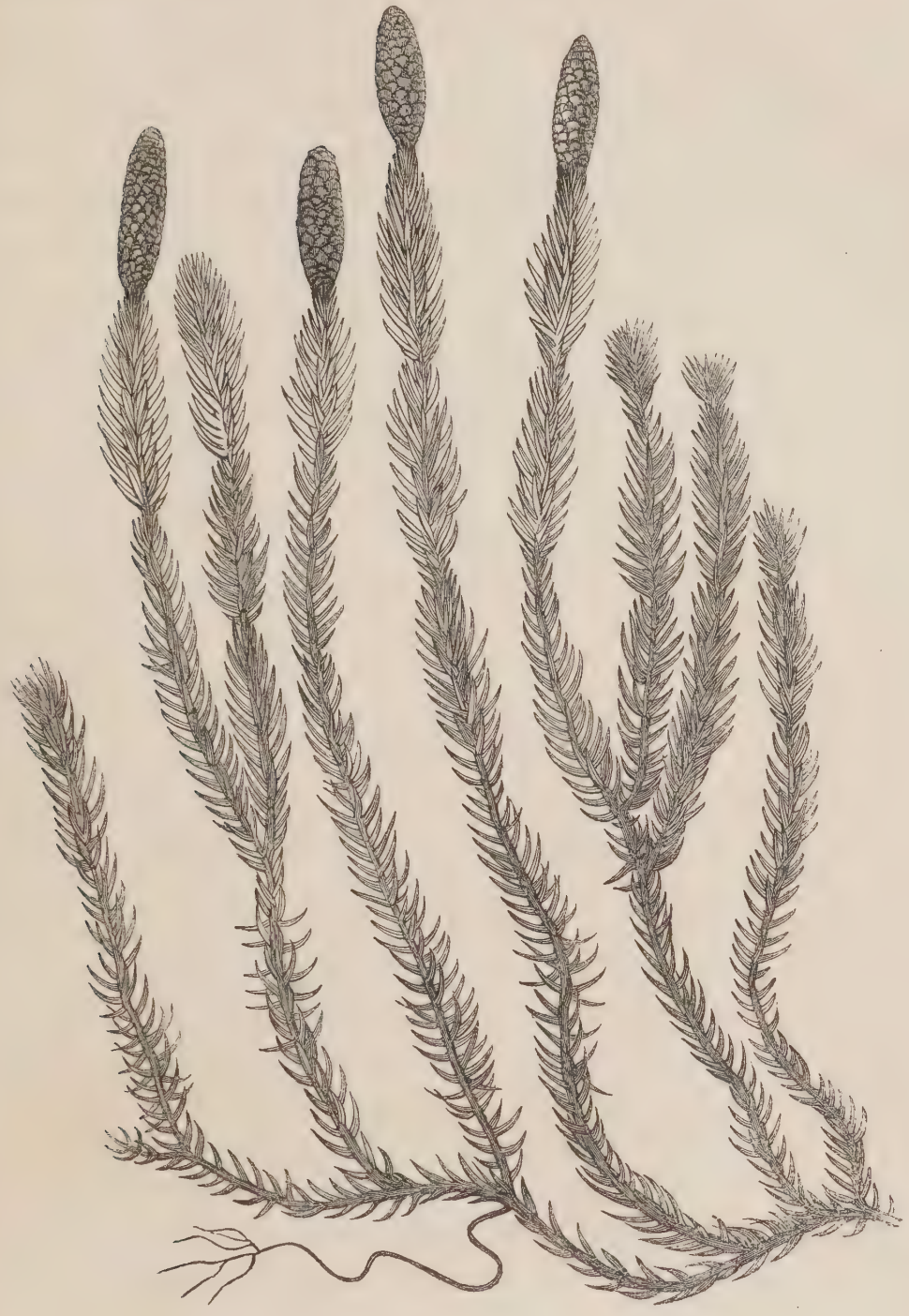
* Muscus terrestris vino pendulo impositus, intra paucos dies illud restituit. * * Hinc quidem apud Germanos muscum terrestrem Weingrein nominant. —Tragus, 555

plants on Crooksbury hill, near Farnham, in Surrey, spreading to a circumference of ten or twelve yards. The whole plant has a rigid, harsh, and wiry feel when handled, even in a living state, but more especially when dried. When the plant is about to produce seed there are thrown out, from various parts of its branches, spikes of about an inch in length, of a pale sulphur colour, and in shape somewhat resembling catkins; these are usually double, but some few are single, and a still smaller number treble; they are erect and straight until the seed has been shed, when they become curved; they are situated on a stalk about twice their own length, and nearly naked, a character which is sufficient to distinguish this from any other of our indigenous species, and which gives to the plant, when growing luxuriantly, as I have seen it at Cwm Idwel and other parts of Caernarvonshire, a most striking and beautiful appearance.

The whole of the branches are densely covered with narrow, flattish, smooth leaves, the edges of which are slightly toothed, and the tips terminate in a filamentous point: the leaves as well as the stems are persistent; I have observed them in March and April perfectly uninjured by our severest winters. On the stalks supporting the spikes the leaves are longer, narrow, and of a pale yellowish green colour; they are closely pressed against the stalk, and disposed somewhat in whorls, thus giving to the stalk the appearance of the stem of an *Equisetum;* they also in a great degree want the long filamentous points which are invariably present on the leaves of the prostrate branches, to the extremities of which they often give a hoary appearance. In the spike itself the leaves are very much broader at the base, being altogether of a more triangular figure, and assuming the appearance and office of bracts or involucres; their colour is pale yellow, and their margins are membranaceous and serrated. After the seed has escaped, these bracts become reflexed, giving to the spike a very altered character and appearance.

The capsules are somewhat reniform, perfectly sessile, and of a pale yellow colour: they are situated at the base of the bracts; each is two-valved, and filled with numerous minute and almost impalpable seeds.

Mr. Moore informs me that "this plant makes a beautiful object when cultivated in a greenhouse, and suspended from the roof or side walls. I have" continues Mr. Moore, "seen it in such situations with branches from three to four feet long, flowering most abundantly, and having a peculiarly imposing appearance: in this state it is not readily recognized by persons familiar with it in its ordinary localities."



INTERRUPTED CLUB-MOSS, (*natural size*).

LYCOPODIUM ANNOTINUM, Linneus.

ALTHOUGH one of the commonest Norwegian and Swedish species, the Interrupted Club-Moss is of rare occurrence in the

British Isles. In England and Ireland it is entirely unknown: in Wales it appears to be confined to a single locality.

Caernarvonshire. — It was first discovered on the side of Glyder mountain above Llyn-y-Cwn, by Llwyd and Ray; the former of whom speaks of its occurring abundantly.* Dillenius corroborates this statement,† and the habitat has been established by modern botanists: Messrs. Borrer, Janson, Woods, and W. Wilson, have seen the plant growing in the same spot, but all these gentlemen found it very sparingly; and in 1839, when I diligently searched the mountain side, I could not find a single plant: therefore, although the observation of Ray is most satisfactorily established, it is still doubtful whether the habitat is likely to be preserved.

In Scotland it seems more abundant, although confined to a few districts: it grows at great elevations, and in wild and exposed situations.

I am indebted to Dr. Balfour for fine specimens from Ben-na-Bourd, in Aberdeenshire; to Dr. Greville and the Botanical Society of London for others from Lochnagar and the Clova mountains. Mr. Watson informs me he has seen it in the mountains of Aberdeenshire and Perthshire. Sir W. J. Hooker has observed it on the Cairngorum range. Mr. Stables, of Cawdor castle, informs me he found it in Rosshire. It has also occurred on Goat fell, in the Isle of Arran, Hay hill, Orkney, &c. "Pretty frequent between 500 and 850 yards on the mountains of Clova and the west of Aberdeenshire: I have never seen it above 900 or below 400 yards: Glen Dole, Forfarshire, and mountains adjacent to Ben-na-Baird, Loch-na-gar, &c."—*Francis' Analysis.*

Although this species is of common occurrence in the North of Europe, particularly in the pine forests, its range appears very limited. It occurs in the British possessions in North America,

* Copiosum observavimus in monte Rhiwr Glyder, supra lacum Lhyn-y-cwn. —Syn. 108.

† Ed. Llwyd primus in Arvonia observavit in monte Rhiwr Glyder, supra lacum Llyn-y-cwn prope ecclesiam S. Perisii, nec non in depressis ejusdem montis Glyder qua rupem y Tryvan spectat, quo in loco ipse etiam copiose ante 14 annos vidi.—Hist. Musc. 455

in several localities; and has been found, though less abundantly, in the United States.

The Interrupted Club-Moss appears to have been well known to our earliest botanists, although nothing remarkable has been recorded of its history. The best figure is that in Dillenius;* that in the posthumous volume of Morison edited by Bobart† is also good; Plukenet's‡ figure is much too small to give a satisfactory idea of the plant; and that in Sowerby's 'English Botany'§ has the fructification too much like the cone of a cedar.

The roots are tough, wiry and tortuous, apparently not long, but very firmly fixed in the ground. The stem is creeping, very strong and tough, and has the surface deeply and irregularly striated: it sends out, at intervals varying from one to four inches, long branches in an erect position; these increase annually in length, the growth of each year being very decidedly marked by the altered length and direction of the leaves; so much so indeed as to give the branches a somewhat jointed appearance. From the marking of each year's growth the name of *annotinum* has probably been given to this *Lycopodium;* a name, however, not exactly appropriate, because the word rather implies of one year's age, leading us to imagine the plant was annual. These upright branches are either single or again divided; and when fertile, which is by no means invariably the case, the spike is usually on the sixth or seventh joint of the branch. After having fruited, or arrived at equivalent age, the erect branches become prone, throw out roots and emit erect branches as before. Connected with this subject Sir J. E. Smith has broached an interesting hypothesis, which I will give in his own words. "The flowering branches are erect, densely leafy, but little subdivided, each terminating in a solitary upright spike, whose scales, being deciduous, seem to leave the branch partly naked, but it afterwards bears proper leaves, except a few diminished ones just under where the spike had been, and produces, in the following season, another spike: hence the jointed

* Hist. Musc. 455, t. 63, fig. 9.

† Morison (Bobart) Hist. Plant. iii. 264, sec. 15, t. v. fig. 3.

‡ Pluk. Phyt. t. 205, fig. 5. § Eng. Bot. 1727.

or interrupted aspect of the branches."* This assertion would surely never have been made without what the learned author believed sufficient ground, and it is with considerable hesitation that I venture to express an opinion at variance with that of so observant a botanist, but I must confess that the specimens I have examined by no means bear out the opinions I have quoted; indeed, were the hypothesis a correct one, should we not find the spike occupying indifferently any joint of the branch, and not so generally confined to those which are numerically the same? Moreover, in a specimen now before me from the herbarium of Mr. S. P. Woodward, the spike exhibits all the symptoms of incipient decay.

The branches, throughout their length, are clothed with linear leaves, which are very acutely pointed and have minute lateral serratures: those on the older portions are somewhat more scattered and distant, an appearance caused by the elongation of the stem itself, the leaves being persistent, and enduring for very many years. Those on the lower portion of the erect branches are often somewhat reflexed, while on the more recent growth they are erect, more crowded, and somewhat imbricated. Smith says that the leaves are ranged in five rows; and an attentive examination of the plant leads one to agree with this remark, still the character is not noticeable, and can only be traced with difficulty.

The spike is oblong, terminal, and completely sessile; the long peduncle, which in the Common Club-Moss separates the spike from the leafy part of the branch, is entirely wanting, a character amply sufficient to distinguish this species from the foregoing. The leaves or bracts in the spike are nearly round, yet have a pointed apex; their edges are membranous and jagged; they become reflexed when the seed is shed: in the axil of each is situated a large, conspicuous, reniform capsule, which, when ripe, opens transversely, allowing the escape of numerous minute, sulphur-coloured seeds.

* Eng. Flor. iv. 321.

SAVIN-LEAVED CLUB-MOSS, (*natural size*).

LYCOPODIUM ALPINUM, Linneus.

THE Savin-leaved Club-Moss, as its name of *alpinum* implies, is completely an alpine plant: it occurs in great abundance on the elevated tracts in Scotland, where I have myself seen it in localities too numerous to detail; and have received a long list of habitats from Drs. Greville and Balfour, Mr. Graham, &c. In several of the adjacent islands it is also found; and Mr. Edmonston has sent a specimen from Unst, the most northerly of the Shetlands.

By the subjoined list of localities it will be seen that the range of this species is confined to the hills of Yorkshire and the lake district in England, and to Snowdon, Cader Idris, Plinlymmon, and the Brecon Beacon in Wales.

Brecknockshire. — The Savin-leaved Club-Moss occurs in several spots near the summit of the Brecon beacon: besides my own notes on this locality, Mr. Lees, Mr. Ralfs and Mr. Westcombe, have handed me similar records.

Caernarvonshire. — I have found it abundantly on all the Snowdon range, but more particularly on Glyder Vawr.

Cardiganshire. — I am indebted to Mr. Lees for specimens from the ascent of Plinlymmon.

Cheshire. — "Moors above Micklehurst: Mr. Bradbury."— *Botanist's Guide.*

Cumberland. — I am indebted to the Botanical Society of London for a specimen from Ennerdale, collected by Dr. Dickenson; Mr. Pinder informs me it is a common plant on the fells; and Mr. Watson that it occurs on many of the mountains.

Denbighshire. — "Moors very common: Mr. Griffiths." — *Botanist's Guide.*

Derbyshire.— Mr. Pinder informs me he has found it in this county, at no great distance from Sheffield.

Durham. — I have several specimens gathered near Falcon clints, and other spots on the Durham side of Teesdale.

Flintshire.—"Under this county we find in the 'Botanist's Guide,' "Moors in Wales, very common: Mr. Griffiths."

Lancashire.—Miss Beever informs me she has found it near Coniston; Mr. Pinder on White-moor near Colne; Mr. Sidebotham at Fo-edge near Bury; Dr. Wood at Fo-edge and Mottram; and Mr. Wilson at Cliviger.

Merionethshire. — I have found it on Cader Idris.

Montgomeryshire.— I am indebted to the Botanical Society of London for a specimen gathered by Dr. Streeten near Llanidloes.

Northumberland. — "Heath S. E. end of Crag Lake, and Cheviot."—*Winch's Flora of Northumberland and Durham.*

Westmoreland. — Mr. Pinder and Mr. Hindson inform me it occurs commonly on the hills and fells in this county. "Over Kirkston: Mr. J. Woods, jun."—*Botanist's Guide.*

Yorkshire.—Mr. Hardy informs me he has found it, although not commonly, on high moors five miles from Sheffield; Mr. Babington and Mr. J. Backhouse, jun. that it occurs on Cronckley fell; Mr. Spruce, on the authority of Mr. Peterkin, gives

Hutton Bushel moor near Scarborough, as a locality; Mr. Babington informs me it is abundant on Ingleborough. In Baines' 'Flora of Yorkshire,' and Turner and Dillwyn's 'Botanist's Guide,' many other localities are enumerated.

In Ireland it is less abundant: Mr. W. Thompson has observed it in the following localities.

Antrim.—On Belfast mountains, &c.

Donegal.—On Muckish.

Down.—On Slieve Donard.

Kerry.—On Mangerton; Mr. Wilson found it on Brandon.

Lycopodium alpinum occurs in alpine districts throughout Europe and Northern Asia; and a very similar species is found in the British possessions in North America, and in the northern states of the Union; but a doubt is entertained whether the European and American species are exactly identical.

There is a pretty good figure of this species in the 'Flora Danica,'* and another in Sowerby's 'English Botany.'†

Our early botanists have so mixed up this with another continental species,—*Lycopodium complanatum*,—that it is impossible to decide to which their observations are to be referred. I have little doubt that Gerarde describes *alpinum*, although his figure evidently represents *complanatum*, and Tragus appears to be unacquainted with it altogether, his figure being likewise that of *complanatum*. Dillenius, as remarked by Sir J. E. Smith, was well acquainted with both species, but unaccountably misquotes Tragus, Gerarde, Dalechamp, and the two Bauhins, under his description of *L. alpinum:* owing to this confusion it is unsafe to quote any of the virtues that have been assigned by these patriarchs of the science to either species.

We are informed by Sir W. J. Hooker that *L. alpinum* is used by the inhabitants of Iceland as a die for their woollen cloths. "A vast heap of *Lycopodium alpinum* lying before the priest's house drew my attention, and on enquiry I found that it was used for the purpose of giving their wadmal a yellow die, which is done by merely boiling the cloth in water, with a quantity of the *Lycopodium* and some leaves of *Vaccinium uli-*

* Flor. Dan. 79. † Eng. Bot. 234.

ginosum. The colour imparted by this process, to judge from some cloth shown me, was a pale and pleasant, though not a brilliant yellow."* The Savin-leaved Club-Moss is a pretty plant, in its foliage much resembling the savin from which it has derived its English name: it retains throughout the winter a much brighter green than either of its congeners; in summer the young shoots have a blue tint. According to Sir W. J. Hooker it is the badge of the clan Macrae.

The roots are tough, strong, wiry, and generally tortuous and branched; they occur at intervals varying from two to four inches, and are somewhat darker in colour than those of *L. clavatum;* they fix the plant firmly to the soil.

The stem is procumbent, extending to a great length, and throwing up at short intervals clusters of branches, which, being twice or thrice dichotomously divided, give the plant a densely tufted appearance: the tips of the branches or divisions in each bunch or tuft are of nearly equal length, the extremities terminating on a level. When the plant is about to produce seed, spikes are thrown out from the extremities of these branches without any intermediate foot-stalk: the spikes are rather more than half an inch in length, and somewhat exceed the unfruitful branches in thickness, and are of a paler, yellower green colour than the rest of the plant: they are almost invariably in double pairs, plainly exhibiting the repeatedly dichotomous division of the branches which they terminate.

The entire plant is covered with elongate, harsh, indistinctly keeled, obtusely pointed leaves; the edges of the leaves are without perceptible teeth or serratures, and the points have no acute or filamentous termination; the leaves or bracts in the spike are membranous, flat, scale-like, serrated at the sides, dilated at the base, and terminating in a prolonged point at the apex. After the escape of the seeds the spikes bend downwards, assuming a semicircular form, and the bracts become reflexed. The capsules are sessile, of a pale yellow colour, and in form much resembling a kidney bean.

* Journal of a Tour in Iceland, in the year 1809, i. 214. Wadmal is the name of the woollen cloth usually worn by the Icelanders.

MARSH CLUB-MOSS, (*natural size*).

LYCOPODIUM INUNDATUM, Linneus.

THE Marsh Club-Moss appears to occur, although not abundantly, on most of the heaths and commons in the south of England, particularly where turf has been pared from the surface. The localities are far too numerous to detail. In the immediate neighbourhood of London many habitats have been recorded. In the midland and northern counties it is less common; in Scotland and Wales it is of comparatively rare occurrence; and in Ireland it is altogether unknown. It is found on wet or turfy ground, generally preferring a sandy or gravelly soil: its non-appearance in Ireland seems rather extraordinary. It exhibits the same predilection for flat and low situations which most of the other species display for elevated and hilly districts, so that it is very rarely found in company with either.

Our early botanists were not generally acquainted with this

species. It is described and figured by Vaillant and Dillenius,* but the latter author has given it a branched and luxuriant appearance which I have never seen it assume. The figure in Sowerby's 'English Botany'† gives a good idea of the plant. Tragus and Gerarde do not mention the plant, and although Plukenet and Morison have been quoted as authorities, I much doubt the correctness of the references. Its medical virtues have not been recorded.

The Marsh Club-Moss is an insignificant and by no means striking plant. In its foliage and solitary spike it more nearly resembles *Lycopodium clavatum* than any other British species; but the nearly circular capsule and other distinguishing characters separate it widely from that, and indeed from all the other indigenous Lycopodia.

The roots are stout; they do not penetrate the earth so deeply as those of either of the species previously described: the prostrate stem creeps close to the soil, and is occasionally, but rarely, branched, the branches still remaining prostrate; the stem appears to be of slow growth, and never increases in size in the same way as that of the species before described; between the points where it is attached by the roots, the stem sometimes assumes an arched appearance.

The growth of each year, with the exception of its extreme point (which remains firmly rooted to the ground), dies during the succeeding winter, the dead portion for some months adhering to the soil, and even after decay leaving a conspicuous black line on the surface. In the autumn each plant throws out an erect solitary spike, situated on a foot-stalk which usually rather exceeds the spike itself in length.

Every part of the plant is densely clothed with linear acute leaves; those on the prostrate stem are invariably curved upwards; on the footstalk they are rather more scattered, erect and without curvature. The leaves or bracts on the spike differ from the others in being broader at the base, and are not unfrequently furnished with a single tooth on each side. The capsules are situated at the base of the bracts; they are nearly spherical, and of a pale yellowish green colour.

* Hist. Musc. tab. 62, fig. 7. † Eng. Bot. 239.

PRICKLY CLUB-MOSS, (*natural size*).

LYCOPODIUM SELAGINOIDES, Linneus.

THIS species, which, without much reason, has obtained the name of the Prickly Club-Moss, is distributed over the hilly districts of the North of England, Wales, Scotland and Ireland. It delights in the vicinity of those little rills so common in hilly countries, and whose course is so often marked by a sinuous line of vivid green, delighting the heart of the botanist, and leading him on from crag to crag, regardless of the crumbling debris and detached masses of stone which in such spots too often give way beneath his tread, and leap with awful bounds down the hill-side, till they find a new resting-place in the abyss below. On such localities has this interesting little plant fixed for its home, and here it may ever be found, the companion of saxifrages and the rarer ferns.

The English and Welch counties, concerning which I have authentic habitats for this species, are few in number.

ANGLESEA. — Aberffraw common is given as a locality in the Rev. Mr. Davies' 'Welsh Botanology.'

CAERNARVONSHIRE.—I have found it throughout the Snowdon district in such localities as I have described above.

CUMBERLAND. — Mr. Pinder informs me he has found it on Scaw fell, in Gatesforth dale, &c.

DERBYSHIRE. — "On Kinder Scout: Mr. O. Sims." — *Botanist's Guide.*

DURHAM. — "Near Middleton in Teesdale: Mr. Robson. Gateshead fell: Mr. Winch. Cronckley fell, and near Egleston: Rev. J. Harriman."—*Botanist's Guide.*

LANCASHIRE. — Miss Beever has found this species near Coniston; Mr. Watson on the common between Bootle and Crosby; and Mr. Wilson at Southport.

NORTHUMBERLAND. — "Prestwick carr." —*Winch's Flora of Northumberland and Durham.*

WESTMORELAND. — "Over Kirkston: Mr. J. Woods, jun."—*Botanist's Guide.*

YORKSHIRE.—The Yorkshire localities for this species enumerated in the 'Botanist's Guide,' Baines' 'Flora of Yorkshire,' and especially in 'The Phytologist,' are very numerous: near York, Castle Howard, Knaresborough, Scarborough, Settle, Thirsk, Richmond, &c. &c. I am indebted to Mr. Spruce for specimens from Stockton forest.

It is far more generally distributed in Scotland. I found it throughout the Western Highlands, and I have received numerous habitats from Dr. Balfour, Dr. Greville, Professor Graham, Mr. Watson, Mr. Babington, and Mr. W. Thompson.

In Ireland it is also of common occurrence in the hilly counties.

ANTRIM.—The late Mr. Templeton has recorded habitats near Larne, and on the Belfast mountains.

DONEGAL.—It occurs on Arrigal, Muckish, and all the hills of this county.

DOWN.—Mr. W. Thompson informs me he has found it on Slieve Donard; and I am indebted to Mr. Mackay for specimens from the Mourne mountains.

GALWAY. — Mr. J. Ball has found it near Leenane in this county; it occurs on all the hills which border the Killery.

LOUTH. — Mr. W. Thompson has found it commonly on Carlingford mountain.

Its range in Europe is not extensive, being almost exclusively confined to northern and alpine districts: it is recorded as a native of North America, but not having seen specimens, and having often felt doubts as to the identity of the North-American species bearing names identical with ours, I refrain from giving an opinion.

Lycopodium Selaginoides was well known to Ray, who considered it generically distinct from all the other British Lycopodia,* in which Dillenius appears to agree with him.† The figure‡ by Dillenius is not inaccurate, but wants that elegance which is so characteristic of the majority of his figures: the other figures of our earlier botanists convey little or no idea of the characters of the plant. The figure in Sowerby's 'English Botany' § is tolerably accurate.

The roots are extremely slender, thread-like and fragile; they take but a slight hold on the crumbling soil in which this species is usually found.

The stem is procumbent, very slender, weak, repeatedly branched; the branches short and somewhat sinuous: the seed-bearing spikes are thrown up at intervals, generally two or three on each plant; they are subclavate, and considerably thicker than the prostrate stem.

The entire plant is clothed with lanceolate leaves, which are serrated and almost jagged at their edges; those on the procumbent slender portions of the stem are shorter, narrower and somewhat scattered, while those on the spike, more properly termed bracts, are every way larger and much broader at the base.

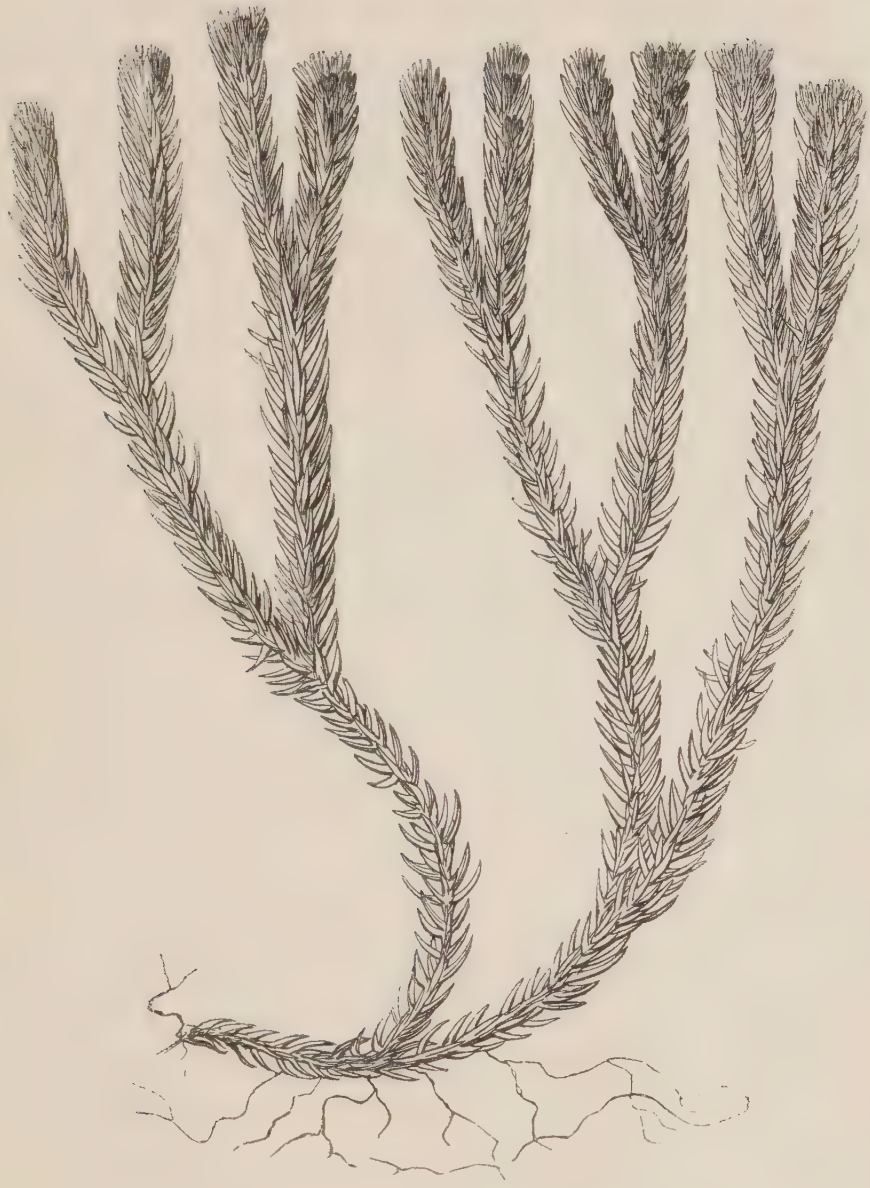
The capsules are sessile at the base of the bracts, pale yellow and tolerably round; the upper ones contain the usual minute pollen-like particles which have already been spoken of as the seeds of *Lycopodium clavatum*, used under the name of '*plaun*' for the production of flashes of light; the lower ones contain larger grains, equal in size to the seed of many phænogamous plants. This double mode of fructification has excited the admiration of botanists from the earliest period, and given rise to a variety of conjectures: some have contended that both the large and small grains are productive seeds; others that the

* Syn. 106. † Hist. Musc. 460. ‡ Id. tab. 68. § Eng. Bot. 1148.

smaller bodies are true seeds, the large ones gemmæ or buds; others that the smaller are abortive and the larger productive seeds; and others again that the larger ones only are seed, the smaller ones being grains of pollen.

Wahlenberg* has given a very clear and accurate description of this twofold fructification. He observes that the capsules containing the graniform seeds are subquadrilocular, in reality bivalve, but sometimes dehiscing in four directions; they occupy the lower portion of the spike, and are larger and more protuberant than those above. The seeds are always four in number, and are so squeezed and pressed together that three triangular areas are produced at the base of each; in this particular they so much resemble the seeds of *Isoetes lacustris*, that, agreeing as the plants do in so many other respects, it is hardly possible to doubt their being closely related. The seeds are nearly as large as those of the poppy, and invariably fall from the capsule entire and are scattered upon the earth, a circumstance quite conclusive against their being anthers, as suggested by Hedwig. Capsules filled with the powdery seed common to the other Lycopodia and the bivalved ferns, occur in the axils of the upper bracts; this powder consists of somewhat hirsute granules, four of which are combined in a tetrahedron, exactly like the seeds in the lower capsules, exhibiting a very obvious analogy between the two kinds of seed, and leaving no doubt of their having the same origin. If therefore the powder emitted from the capsules of *Botrychium Lunaria* be true seed, it follows that the powder produced by the capsules of *Lycopodium Selaginoides* is seed also. It cannot be male pollen, its appearance being precisely synchronous with that of the mature seeds. The spike itself is annual, decaying immediately after it has fruited in July or the beginning of August, and the next year a new spike springs from some other part of the prostrate stem, on no part of which can a trace of future capsules be found. From these circumstances it seems probable that the only difference between the granules is that of size, each being to be regarded as true seed: a somewhat analogous discrepancy occurs in the varied form of the seeds of spinach.

* See Appendix H.



FIR CLUB-MOSS, (*natural size*).

LYCOPODIUM SELAGO, Linneus.

THIS plant appears to be more generally distributed throughout the kingdom than any other, with the exception of *clavatum*. It ascends the summits of our highest mountains, as Ben-na-Muich-dhu, Ben Nevis, Ben More, &c. in Scotland; Snowdon, David, Llewelyn, Plinlymmon, Cader Idris, &c. in Wales; Ingleborough, Skiddaw, Helvellyn, &c. in England; Muckish, Arrigal, Ben Bulben, Slieve Donard, Mangerton, Carran Tual,

Brandon, &c. in Ireland : and I have noticed that it is frequently found at a greater elevation than *L. alpinum*, an observation confirmed by Mr. W. Thompson, and other observant botanists. Still it descends very nearly to the sea level, occurring on the heaths of Surrey, in the forests of Sussex, and in hundreds of localities throughout the southern and midland counties : indeed so numerous are these that I should not be justified in giving them all, and were I to select some and omit others I should be guilty of injustice to many who have kindly taken great pains to supply me with information.

On the Welch mountains I have observed that only a portion of the plants appear to be in a thriving and healthy condition, the larger ones almost invariably being loaded with fructification, and exhibiting symptoms of incipient decay. With the exception of Dillenius I think no author has noticed this peculiarity ; and this learned writer rationally concludes that each plant exists for a definite term and then dies.* Whether the term of its existence be biennial, triennial, or longer, I leave for future observers to decide ; but I have not the slightest doubt that its existence has a fixed term, as suggested by the great muscologist.

The figures of this plant can scarcely fail of being characteristic, its appearance is so different from that of our other species : Dillenius figures several varieties, all of them very expressive of its distinguishing features. These varieties appear to be the result of locality : when last at the Birmingham Botanic Garden, Mr. Cameron called my attention to some living specimens which he had himself collected on the Titterstone Clee hill ; in these the lower leaves were considerably narrower and somewhat reflexed, and the plants (as indeed do all from the same locality) exhibited a uniform although scarcely describable difference from those of Scotland, the North of England, and Caernarvonshire ; and these again differ from the specimens

* Quum ante 14 annos montes Cambriæ plantarum gratia peragrarem, Augusti fine, plures plantæ semiaridæ et quædam mortuæ mihi visæ sunt, cum initio hujus mensis omnes virerent ; id vero tam in majoribus quam in mediæ magnitudinis plantis mihi observatum. Ex quo singulas aliquot annos durare et postea interire conjicio.—Hist. Musc. 436.

collected in Norfolk, Sussex and Surrey, which are also of uniform appearance, of much smaller size, and have the branches obtusely pointed rather than flat-topped. When rooted in the fissure of a rock it occasionally assumes a pendulous character, the branches being very long and their extremities recurved; in this state the whole appearance of the plant is graceful and elegant, and totally dissimilar to its normal form; such specimens I have found on the rocks in the Pass of Llanberis, and my brother has lately procured a fine example on the ascent of Plinlymmon. Mr. Babington, in a note to me, observes, "I have a curious specimen which was growing under a rock near Llanberis, in which the stems are prostrate and about a foot in length, and the leaves less densely placed than is usual in the species."

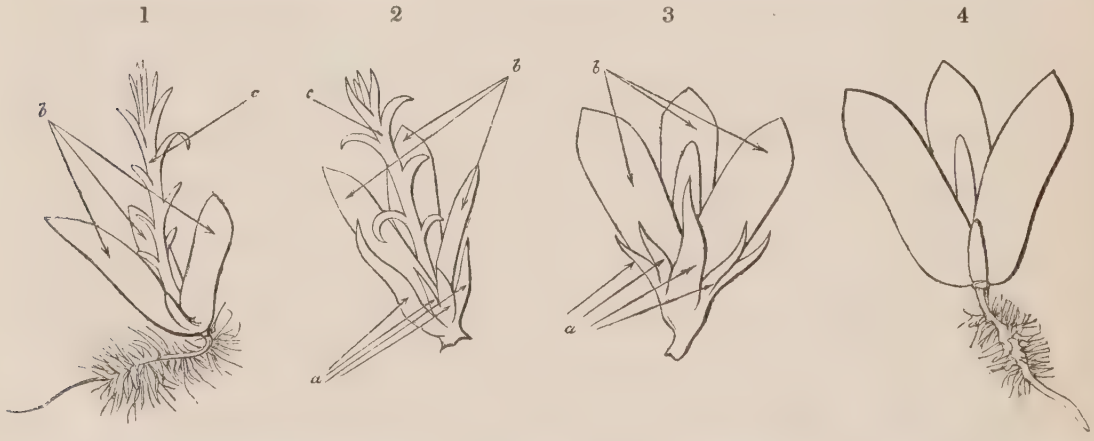
This species has received credit for many extraordinary medical properties; I shall record only a few of these. In the 'Flora Prussica' it is recommended as a specific for ruptures, bruises, &c. Breynius asserts that a decoction of it destroys the lice which infest man; and Linneus informs us that the Swedes employ it to kill those of swine and cattle. Schwenckenfeldius says that it is used by countrymen as a cathartic and emetic; and Linneus, on the authority of Rothman, adds that it is sold, though not commonly, in the chemists' shops of Sweden, under the name of "*muscus catharticus*," and is prescribed in the form of a decoction as an emetic; but remarks that the dose must be very weak, otherwise it is likely to produce convulsions. Lightfoot says that it is taken by the Highlanders both as a cathartic and emetic, but unless used in small quantities it induces giddiness and convulsions; he also informs us that in the island of Raasay, near Skye, and in some other places, it is used instead of alum, to fix colours in dying woollen cloths.

The roots are numerous, tough, wiry, tortuous, and often divided: they are emitted from divers parts of the stem, always however where it is in contact with the earth. The plant in its normal form appears to be perfectly erect, but its hold on the ground being apparently insufficient for the maintenance of this position, it generally becomes partially recumbent, as represented in the figure. This change takes place as soon as the plant has

risen above the stunted herbage with which it is commonly surrounded, and has thus subjected itself to the action of the violent winds that seem to be almost incessantly sweeping the mountain-sides.

The stems are repeatedly dichotomous, stout, rigid, somewhat flat-topped, and usually erect.

Every part of the plant is densely clothed with rigid, lanceolate, acute, entire leaves, much resembling those of *Lycopodium annotinum*. At the upper extremity of each branch a portion of these leaves become transformed into irregular 6-cleft calyces or cups, very closely resembling the perichætia of mosses; the outermost lobe of the six which compose this cup is longer and larger than the rest, and of the pair on each side one is generally incumbent on the other, so as nearly to conceal it; this was overlooked by Lightfoot, who, in speaking of the cup, describes it as consisting of "*four* stiff, lanceolate, incurved, minute leaves." This perichætial cup is shown in the margin, and also at *a a*, in figures 2 and 3 of the cut below. Lightfoot, in continuing his description, goes on to say, "at the bottom of this calyx are five small pellucid substances resembling leaves, which are supposed to be analogous to pistils; these in time grow up into three large broad leaves, two united together like the hoof of an ox, &c." I have only examined these parts



when in the mature state. Instead of terming the interior processes *leaves*, I should be inclined to say that within each perichætial cup already described, is situated a kind of flattened

gemma or bud, consisting of five distinct lobes or component parts, combined at the base; the three inner lobes are large, prominent and conspicuous, even to the naked eye, (*b* in figures 1, 2 and 3); the two outer lobes are very small, and may easily be overlooked; one of them is closely appressed to the anterior, the other to the posterior surface of the bud.* These buds, which have no representatives in either of the previously-described British species of *Lycopodium*, are truly the germs of future plants, as each, when mature, is detached from its peri-chætial socket with the slightest touch, falls to the earth, and germinates with the greatest readiness: figure 4 represents a bud thus germinating; it is drawn from a specimen found in a state of nature. From the under surface of what may be termed the collum or neck of the bud, is protruded a single stout root, at first very pilose, but soon becoming smoother; and in the centre of the three large lobes appears what might readily be mistaken for a sixth and central lobe, but which is, in reality, the undeveloped stem or ascending axis of the young plant. This part is very observable in figures 3 and 4, in the centre of each figure. As germination advances this axis gradually becomes elongated upwards by the successive unfolding of the leaves, which are spirally arranged round it. The stem in this advanced state is shown at *c c*, in figures 1 and 2. When the leaves first unfold at the apex of the stem they are erect, but soon assume a spreading direction, and finally become reflexed.

Whether these buds remain attached to the parent plant or fall to the ground, their germination proceeds in the same manner; for when grown in a closed glass case, a situation which precludes the action of wind and rain, and therefore lessens the chance of their being dislodged, the buds germinate *in situ*, giving to the extremity of each branch a bushy and very remarkable appearance. A single bud thus growing in its perichætial socket is shown at figure 2. A plant from the Titterstone Clee hill, cultivated by Mr. Luxford in a closed glass, died during

* Dillenius was the first to notice these gemmæ. "Eodem tempore observavi per ramos præsertim superiora versus e foliorum alis, corpuscula cristata, crebra rigida e sex laciniis inæqualibus composita."—Hist. Musc. 436.

the second year, leaving green and vigorous young ones growing on the parent stem. Some of the gemmæ were accidentally detached when the specimen was planted in the glass; these have vegetated on the surface of the soil, and produced young plants, one of which is now more than an inch high.

It appears to me that by these gemmæ the plant is so abundantly propagated in a state of nature, and not by its seeds. In a paper by Sir J. E. Smith, printed in the 'Transactions of the Linnean Society,' Mr. Joseph Fox, of Norwich, is said to have raised young plants of *Lycopodium Selago* from seed. The record of these experiments appears to me very unsatisfactory, as no detail is given, and I am quite inclined to suppose that the gemmæ were mistaken by that industrious individual for the seeds; if so, his observations have been verified by many subsequent cultivators.*

I have already stated that the perichætial leaves and their buds occur near the extremities of the branches; below them, and in the axils of the ordinary leaves, are produced the true capsules, each ultimate branch being alike fertile throughout the greater part of its length. The capsules are sessile, large, yellow, reniform and bivalve; their dehiscence is rectilinear and longitudinal, but rarely takes place in a state of nature. In every plant that I have examined while living, the capsules have been firmly closed; by pressure however they may be compelled to open, when they are found to be filled with minute yellow seeds. A detached leaf, with its axillary capsule, is represented in the margin.

* The passage referred to is as follows:—"Mr. Joseph Fox, a journeyman weaver of Norwich, * * showed me in the year 1779, young plants of *Lycopopium Selago*, raised from seed in his own garden.—Trans. Linn. Soc. ii. 315.

QUILLWORT.

ISOETES LACUSTRIS, Linneus.

THE Quillwort, though confined to our mountain lakes, is an abundant plant in such situations, clothing the bottoms of the deep and still waters with a perennial verdure, and supposed by the casual tourists to be a submerged grass.

From the following list of English and Welch localities, it will be at once seen that its geographical range is very limited.

Brecknockshire. — Mr. Ralfs informs me he found it in the lake below Brecon Beacon.

Caernarvonshire. —I have found it in more than a dozen of the little lakes which abound in the Snowdon range, and this appears to be one of the earliest recorded habitats. It was found in Ogwen, Lyn-y-cwn, and the lakes of Llanberis, by Llhwyd, Ray, Richardson, and Dillenius, the latter of whom waded into the waters of Llanberis purposely to find it. The imagination of a botanist delights to picture the Sherardian professor in this interesting situation: his shoes, with their enormous silver buckles, and his grey-ribbed hose, are seen reposing on the strand; his important bag wig and his formidable military hat, sharply looped on three several sides, adorn his learned head; the ample skirts of his coat are gathered on one arm, whilst the other hand grasps a gold-headed cane, wherewith to uproot the brittle *Calamaria*. I will quote the entire passage in which this adventure is recorded; the mention of uncomfortable lodgings will be amusing to those modern botanists who have feasted in the palace-like hotel, now standing almost on the site of the philosopher's pathetic lamentation. "I found the common *Subularia folio rigido*, mentioned to grow only in Phynon Vreech, and the *Juncifolia cochleariæ capsulis** pretty plentifully, which relieved me very much of our disappointment of not seeing more Glyder plants. In the lake near Llanberis, a little further on, where you found the *Subularia fragilis, folio longiore et tenuiore*, cast out of the lake, I pulled off my shoes and stockings, and found it growing there in great plenty. If any body had the means of fishing out plants from the depths of these lakes, I am inclined to think he might find strange things. Near this place, about three years ago, Mr. Evans, coming home late from a christening, in stormy and rainy weather, was drowned. His corpse could not be found by any means used for fishing. There being no parson living at the place at present, it is almost impossible for any body to go herborizing thither. We had very hard and uncomfortable lodging at the alehouse, and with difficulty got a young man to be our interpreter and guide. At last

* Subularia aquatica.

young Mr. Evans, of Bangor, gave us leave to lie at his house, and sent us provisions from Bangor.

"If some rich botanist, that has no relations or children, would build a house there, and buy some land to it, which might be done with little money, it would be a very kind invitation for botanists to visit these strange places, and be an inducement for making a collection of Welsh plants, as you proposed. Without such a fixed place of abode it seems to me impracticable."*

Dillenius learned from the mountaineers of the neighbourhood, that fish feed on the *Isoetes;* and that when detached from its hold in the soil and cast on shore, the cattle devour it greedily and grow fat on it.† The passage is rather obscurely worded, and its meaning seems to have been mistaken by compilers, who make it fatten the fish, and leave the bullocks out of the question.

CUMBERLAND. — Mr. Winch found it in Wastwater; and Mr. Wilson informs me he found it in Floutern tarn, near Buttermere. "In Derwent water: Mr. Woodward. Ullswater, Lower end and Gowbarrow-wike: Hutchinson."—*Botanist's Guide.*

DENBIGHSHIRE. — I am informed by Mr. Watson that Mr. J. E. Bowman found it in the lakes of Denbighshire.

LANCASHIRE.—Miss Beever, to whom I am indebted for both living and dried specimens, informs me that it occurs not uncommonly in the lakes near Coniston.

NORTHUMBERLAND.—"Prestwick carr: Mr. Thornhill."—*Botanist's Guide.*

WESTMORELAND. — Mr. Pinder has found it in nearly all the lakes of this county.

YORKSHIRE. — Mr. Ibbotson has obtained specimens from Castle-Howard lake, and from the Foss reservoir near Coxwould.

In Scotland, notwithstanding the preponderance of hilly country, the Quillwort has not yet been found in so many localities as I should have anticipated from the frequency of its occurrence in the Snowdon district: the following are all that I am acquainted with.

* Linn. Correspondence, ii. 143.

† Referunt monticolæ pisces, quos habent optimi generis, utraque hæc herba vesci, et armenta, si projectam inveniant, avidè devorare et pinguescere.—Hist. Musc. 542.

ABERDEENSHIRE.—"Loch Callader: Mr. W. Brand."—*Francis' Analysis.*

BUTESHIRE.—I learn from Mr. Gourlie that Mr. Murray found it in Lóch Ascog, in the Isle of Bute.

DUMBARTONSHIRE. — Mr. Gourlie informs me he has found it in Loch Sloy, on Ben Voirlich.

FORFARSHIRE.—I am indebted to Dr. Greville and Dr. Balfour for specimens from Loch Brandy, in this county. Mr. Babington and Mr. Watson, on the authority of Mr. Brand, also give me Loch Brandy as a locality. "Loch Whirrall: Dr. Graham." —*Francis' Analysis.*

INVERNESSHIRE.—I am indebted to Dr. Greville for specimens from lakes in the Coolin hills, Isle of Skye.

PERTHSHIRE.—I learn from Mr. Gourlie that Dr. Stewart found it in Loch Tay; and Professor Graham informs me he found it in a pool at the south end of Loch Lubnaig.

The following Irish localities are all that I am acquainted with.

DONEGAL.—It occurs in many of the lakes of this county.

GALWAY.—It occurs not uncommonly in the lakes of Cunnemara.

MONAGHAN. — I am informed by Mr. W. Thompson that it is recorded by Mr. Templeton as having been found by Mr. Brown in Castle Blaney lake, in this county.

WICKLOW.— From the same source I learn that it was discovered by Dr. W. Stokes in Upper Lough Bray; Mr. Templeton saw it there in July, 1802; and I have found it at Glendalough.

The Quillwort occurs throughout Europe,* more especially in the northern kingdoms; in England it is the concomitant of the

* Roth gives it in his 'Flora Germanica,' and Hoffmann in his 'Deutschland Flora,' but Weber and Mohr exclude it from their 'Botanisches Taschenbach' with this observation. — Floræ germanicæ civibus quidem adnumerata est. Sed cum Holsatia nostra certus locus natalis rari hujus vegetabilis unicus sit laudata, specimina vero in patica provincia lecta videre nobis non contingerit, temere plantam denuo uti indigenam introducere nostrum non censuimus. Cæterum omnia omnium terrarum specimina, quotquot Isoetis lustravimus unius ejusdemque speciei ut putemus necesse est; et gaudemus, consentaneum hac de re ex litt videre am. sagacis. Wahlenberg, plantarum omnium, et cryptogamarum imprimis, scrutatorem, sincerrima fide dignissimum. — Deutsch. Crypt. Gew. 63.

wildest mountain scenery. It is recorded as a native of North America.

The figures by Dillenius* are striking, but in some points scarcely accurate. That in the 'Flora Danica'† possesses none of the characteristics which distinguish the root of our British species, and this part of the drawing is either supplied from imagination or drawn from a species hitherto undiscovered in this country. The same observation applies to the figure of the capsule in 'English Botany,'‡ where that part is represented as bivalved. Sir W. J. Hooker's figure in the 'Flora Londinensis' § is the best that I have seen, but in this there is an indistinctness in the representation of the tuber. In Loudon's 'Encyclopœdia of Plants,'‖ the capsule of *Pilularia* is given as that of *Isoetes*, and that of the latter is entirely omitted.

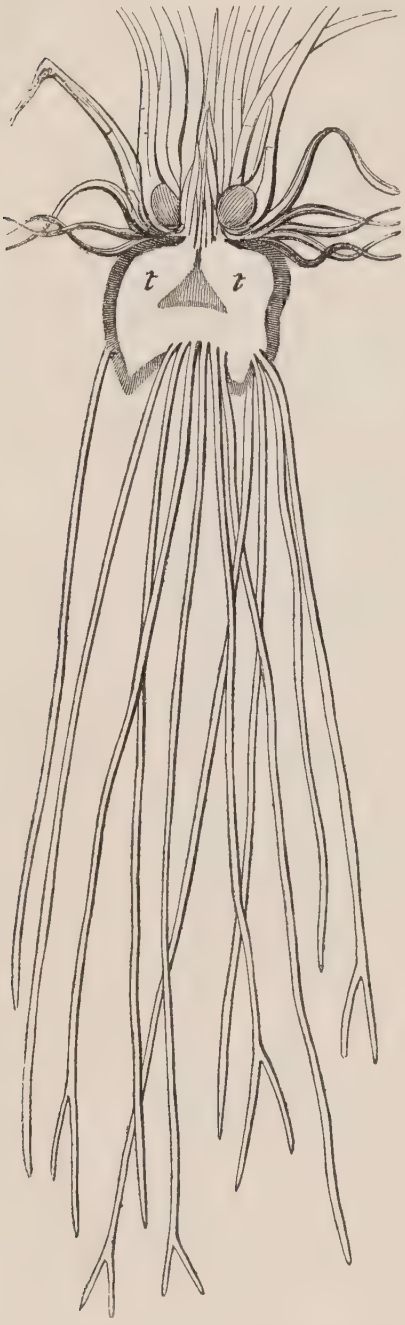
I quite concur with Sir J. E. Smith in believing this plant to be the *Subularia vulgaris erecta folio rigidissimo*, and also the *Subularia fragilis folio longiore et tenuiore* of Ray's 'Synopsis:'¶ the plant introduced between these two appears to be the *Littorella lacustris* of modern nomenclature. Our plant was also the *Calamistrum* of several of the older writers, and the *Calamaria* of Dillenius.** It should, however, be observed that the three names—*Subularia*, *Calamistrum* and *Calamaria*—appear to be used indifferently in various parts of the Linnean Correspondence. I believe all modern botanists are agreed on the name of *Isoetes lacustris*.

With the exception of the observation of Dillenius already quoted, about fishes and bullocks, and a note in Sprengel implying that fishes root it out of the mud, I can find no information as to the uses or virtues of the Quillwort. Gerarde appears not to have known the plant, or he would doubtless have given us some account of its properties.

The roots are three or four inches in length, flexible, semipellucid, of uniform substance, tubular, and sometimes dichotomously divided towards the extremity. They spring from a tuber, which, in mature plants, is about the size of a hazel-nut.

* Hist. Musc. tab. 80, figs. 1 and 2. † Flor. Dan. 191.
‡ Eng. Bot. 1084. § Flor. Lond. 131. ‖ Encycl. 894.
¶ Syn. 306, 307. ** Hist. Musc. 541.

This tuber seems analogous to what I have called a tufted rhizoma in ferns : it is of various form, commonly, however, slightly bilobed; its external coating is spongy, and of a dark brown colour approaching to black, and apparently composed of decaying portions of the tuber : the interior is very compact and of a pure white, with a small and nearly pellucid portion in the centre, whence the leaves appear to originate. The taste of this tuber is earthy, but not otherwise remarkable, and it seems perfectly innoxious, as I have eaten several without injury. A longitudinal section of the tuber (*t t*) with its attached roots, is shown in the margin. Wahlenberg says that this tuber vegetates in the interior while dying round the circumference,* a mode of accounting for its appearance which seems highly probable.



The leaves are sessile, and rise from the crown of the tuber; at the base they are very broad, and furnished with membranous margins, which clasp the inner leaves much in the same manner as the scales of a lily-bulb. With the exception of this basal portion, the leaves are nearly cylindrical, somewhat however approaching to a quadrate form, with obtuse angles, and terminating in a sharp point; they are hollow, the interior being divided by longitudinal septa into four tubes, which are again

* I quote his admirable description entire. — "Memorabilis hæc planta in Vermlandia ferrimontana admodum vulgaris est, ibique eam variis temporibus anni examinavi et Lycopodiis adeo affinem esse comperi, ut non nisi seminibus numerosis graniformibus in capsula evalvi differt. Caudex radicis constituitur

subdivided into numerous compartments by transverse septa placed at irregular distances: these transverse septa are very apparent through the semi-pellucid substance of the leaf, and give it a jointed appearance. The leaves are extremely brittle, and usually break at these apparent joints. They are persistent, the plant being in every respect an evergreen, whence the Linnean name of *Isoetes*,* signifying that its appearance is alike throughout the year. The exterior leaves decay slowly

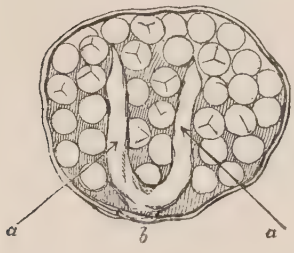
---

taleolo satis crasso quam nux Avellanæ sæpe majore, in centro vegetante et ad ambitum morituro; radiculis simplicibus in terra infixo. Anatomia instituta similitudinem summam cum Filicibus truncosis demonstravit, ut nullum sit dubium quin Monocotyledonea est. Folia basi lata et deltoidea inseruntur ibique marginibus hyalinis instruuntur; sed superne cepacea subtetragona: loculis quatuor a septis transversalibus alternantibus iterum divisis. *Capsula* utriculum tenuissimum membranaceum refert, in folii basi adeo subinclusa ut tantum pars media lateris interioris nuda patet; de cætero tum superne ac inferne libera et a fovea includente soluta; sed postice adnata est nervo vel costæ mediæ folii, idque longitudinaliter. Ex illo receptaculo fructus longitudinali oriuntur plura receptacula seminum seu partialia filiformia, capsulæ cavum trabecularum instar trajicientia vix tamen parieti interiori adfixa; quæ longitudinaliter disposita dissepimentum spurium quodammodo referunt. Semina matura et elabentia crustacea sunt et albissima, ob scabritiem quandam osseam stridula, magnitudine seminum Papaveris, ex uno latere notata areolis ternis triangularibus a pressione et connexione quaternata seminum juniorum ortis; semina quoque juniora semper proprio huic ordini characteristico modo quaternatim connata reperi intra testam communem inclusa. *Capsulæ aliæ fariniferæ* præcedentibus adeo simillimæ ut nulla differentia respectu formæ et texturæ internæ existit. Harum farina re vera seminula est seminibus majoribus graniformibus ultra vigecies tenuiora, de cætera in tenella ætate eodem modo quaternatim connata primumque in testa communi inclusa, ut non possunt non ejusdem indolis esse ac seminula capsularum fariniferarum in *Lycopodio selaginoide*. Nec ætate a seminibus majoribus differunt, elabunt enim eodem tempore eodemque modo. Respectu situs capsulæ graniferæ exterius positæ sunt, et fariniferæ interius; sed intra has capsulas fariniferas iterum adsunt folia cum tenellis capsulis graniferis in quibus semina non tantum quaternatim connata verum etiam in testa communi inclusa. Adhuc magis interiora versus reperi quoque tenellas capsulas fariniferas, idque in speciminibus maximis per plures vices alternantes. Numne vero interdum capsulæ graniferæ et fariniferæ respectu situs inter se miscuntur, difficile est expertu."—Flor. Lappon. 294.

* ισος æqualis, ετος annus.

and in order of priority, the decay commencing in each leaf about an inch above the crown of the rhizoma, and extending upwards and downwards; the decayed portion soon loses its rigidity, the upper part bending over and becoming prostrate. The leaf retains its attachment long after its vitality has ceased; and numerous leaves so attached fall over the tuber when the plant is taken from the water, and, mingling with the roots, are preserved as such in most of our herbaria. Leaves in a state of decay are shown in the figure at page 381.

The fructification of the Quillwort is very curious. It consists of capsules, about the size of swan-shot, placed singly at the base of each leaf, in the very substance of which they are imbedded; only a very small portion of the capsule being visible through a circular aperture in the anterior face of the leaf. In this structure it differs widely from *Lycopodium*, in which genus the capsule is quite distinct, although perfectly sessile in the axil of the leaf, and removable without injury to the leaf itself. The substance of the capsule is hard though membranous; it is attached at a single point (*b*) on its posterior surface, to something which appears analogous to a midrib of the leaf. The figure in the margin represents a capsule removed from its cavity in the leaf: from its point of attachment (*b*) arise what appear to be two free placentæ (*a a*) for the attachment of the seeds, yet I cannot positively assert that such is their office, for I have never opened a capsule without observing that the seeds escaped, as if entirely without attachment. Wahlenberg speaks of these bodies as being *many*, and has represented four diverging from one point of attachment: from this statement, and that author's surpassing accuracy, I am inclined to suppose the few capsules which I have had the opportunity of examining in a recent state, and more especially the one which I have drawn, to be exceptions to the general rule, especially as in the generic character of *Isoetes* in 'English Flora,'* Sir J. E. Smith describes the capsule of the fertile flowers as having "several transverse



* Eng. Flor. iv. 330.

bristle-shaped bars." Be this as it may, I have preferred in this, as in other instances, representing nothing more than I have seen. Wahlenberg also represents — and other writers have adopted his view — the seeds attached to these placentæ: this also appears to be highly probable, but I have hitherto failed in my attempts to prove it correct. The seeds themselves are rugose and perfectly white; they have raised ridges on the surface, indicating a quadruple division; indeed, when thus divided, the inferior half of each seed is nearly hemispherical, and the superior half may be again divided into three sub-triangular portions. When crushed, even after the lapse of years, these seeds are found to be filled with a transparent and somewhat oleaginous fluid. Other capsules contain apparent seeds, which are extremely minute, being scarcely equal in size to the pollen-granules of many flowering plants: these minute bodies possess the form and characters of the larger seeds. The capsules containing the two kinds of seed are scarcely to be distinguished from each other, nor do they follow any law in their relative position, as many of our botanists have asserted, but most frequently occur alternately. Linneus, in his 'Iter Scanicum,' has described these as male and female flowers,* but botanists are not agreed as to their precise nature; the question, when discussed, must comprise the kindred twofold fructification of *Lycopodium Selaginoides*, and probably many other species: the real nature of the four portions into which each (supposed) seed is divisable, also requires further investigation.

There are two forms of *Isoetes*, so different that Dillenius, and, in some of his works, even Linneus, treat them as distinct species; thus in the passage quoted from Dillenius, at p. 382, they are designated "*Subularia folio rigido*" and "*Subularia fragilis;*" and in his great work, the 'Historia Muscorum,' the same author describes them as "The short and thick-leaved

* *Masculi flores* solitarii intra basin foliorum interiorum. *Cal.* Squama cordata, acuta, sessilis. *Cor.* nulla. *Stam.* Filamentum nullum. Anthera subrotunda, unilocularis, intra basin folii sita.

Feminei flores solitarii in eadem planta, intra basin foliorum exteriorum. *Cal.* ut in masculis. *Cor.* nulla. *Pist.* occultum. *Per.* Capsula subovata, bilocularis, intra basin folii sita. *Sem.* numerosa, globosa.

Quillwort, *Calamaria folio breviore et crassiore*," and "The long and slender-leaved Quillwort, *Calamaria folio longiore et graciliore;*" and enters very clearly into their distinguishing characters.* The following paragraph from a letter of Linneus to Haller, written in 1749, and printed in Smith's 'Selection of the Correspondence of Linnæus, &c."† proves that this great botanist considered the two forms to be species. — "In Scania I have met with the flowers, male as well as female, of both species of *Calamistrum*, figured by Dillenius, in his *Historia Muscorum*, by the name of *Calamaria*."

Gray, in his 'Natural Arrangement of British Plants,'‡ makes two varieties in addition to the normal form of the plant, and describes them as follows.

β. *gracilis*. Leaves long, slender.
Calamaria folio longiore et graciliore. Dill. M. 541.

γ. *fragilis*. Leaves very brittle, slender, pointed, transparent, pores numerous, minute.
Subularia fragilis, folio longiore et tenuiore. Raii Syn. 307, 3.

By a reference to Ray§ it will be seen that this *Subularia fragilis* is an addition by Dillenius, and is probably identical with the *Calamaria folio longiore* &c. of that author; the forms are thus again reduced to two, and concerning these Mr. Wilson, who has paid great attention to the subject, kindly sends me his opinion in the following words.—"The solitary plants with short spreading leaves, I believe to be the first full development after the seedling state, and before any lateral extension of the rhizoma has taken place: when the plants are crowded together, either by lateral increase (or offsets) or by a multitude of individuals in close contact, the fronds can grow only in an erect posture. In a specimen from Llyn Ogwen, the tallest I have, and which I cut through the middle before drying, the section of the rhizoma or tuber is very large, while in another specimen,

* Calamaria folio longiore et graciliore. The long and slender-leaved Quillwort. A precedenti differt foliis longioribus angustioribus et rectioribus: radix porro durior, minus tuberosa, minusque crassa est et fibræ ejus breviores sunt et magis ramosæ, cæteroquin foliorum texturam, colorem, semina et reliqua habet communia.—Hist. Musc. 541.

† Linn. Corresp. ii. 433. ‡ Nat. Arr. ii. 24. § Syn. 307.

gathered in the same place, and at the same time, the rhizoma is very small and inconspicuous; in a third specimen the rhizoma is very broad and concave at the base. The size of the tuber may depend on the age and vigour of the plant; its analogy with the rhizoma of ferns I think considerable: when a number of the outer or lower fronds have ripened and dropped off, then and not before it becomes exposed to view."

Mr. Sansom has given the two supposed species a minute and careful examination, and has favoured me with the following remarks. — "In the diffuse variety the seeds are globular or nearly so, and the sutures in many cases very indistinct, while in the erect plant the seeds are angular, the angles appearing to be formed by the swelling of the edges of the sutures, and thus giving it an angular appearance. Again, the texture of the seed is different; in the diffuse plant it has a slightly pellucid appearance, while, in the erect variety, they are of a firmer texture, appearing quite white and horny." Mr. Sansom, however, suggests, with great propriety, the probability of the seeds which he examined being in different stages of maturity; those which I have examined do not exhibit the differences which he has pointed out.

Professor Graham says, "I have found the slender tufted form noticed by Mr. Wilson, growing among the stouter solitary kind, with broader, shorter, spreading leaves, which are sometimes even recurved. I have been in the habit of attributing the first appearance to depth of water, and to the plants being younger; but I have not observed these appearances with sufficient attention to be very positive about this."

Sir J. E. Smith attempts an explanation of the cause of these varieties which I cannot consider entitled to much respect: he says, "The taller, more slender and brittle variety β., observed by Dr. Richardson, may perhaps be caused by those sudden risings of the water so frequent in mountainous countries, which will account for all the peculiar characteristics of this variety."*

The solution of the problem appears to me to be this. When the seeds arrive at maturity, the leaf, in whose base the capsule

* Eng. Flor. iv. 331.

is situated, decays, and losing its rigidity sometimes becomes torn or broken off by the action of the water, thus permitting free egress to the seeds which in all probability rise to the surface of the water, and, being carried about by the action of wind, germinate after a certain number of days, and then, sinking to the bottom, take root and become isolated plants of the dwarf, brittle, spreading kind. It must be observed that this escape, floating, germinating, and sinking of the seed, have been fully ascertained in the species next described, and therefore is very probably take place in *Isoetes*. But although some seeds escape in the manner I have described, by far the greater number remain in the capsule, and there germinate, throwing up the most dense tufts of slender leaves, of a vivid and very delicate green colour. I am indebted to Miss Beever for specimens which beautifully exhibit this germination of the seeds *in situ*, the parent plant and its offspring having been dried while in the most favourable state for displaying this peculiarity, to which Miss Beever particularly called my attention. These young plants rapidly increase in size, send their roots downwards into the earth, and their leaves upwards into the water; and from the crowding incident on this condition of the seedling plants the elongate and slender leaves would naturally result. This germination of the seed *in situ*, I moreover imagine to be the true cause of the appearance of "crowding by lateral increase," spoken of by Mr. Wilson. The specimens deposited in the herbarium of the Linnean Society, will, I trust, not only fully establish the fact that this is the usual mode of increase in this truly remarkable plant, but will induce many to agree with me, that it is also sufficient to account for the difference in habit between plants reared in this way and those which spring from escaped and dispersed seeds.

It appears from a passage in Ray's 'Synopsis' that the Quillwort may be cultivated with success in fishponds.*

* Quamvis Dr. Richardson in piscinis suis plantaverit, ibique læte vigeat planta, &c.—Syn. 306.

PILL-WORT, (*natural size*).

PILULARIA GLOBULIFERA, Linneus.

THE Pill-wort or Pepper-grass is found on the extreme margins of ponds, or on swampy ground, submerged during the winter and more or less exposed during the summer. It is sometimes so abundant as to form a dense and almost inextricably matted covering to the ground. In no instance that has come to my knowledge has it been found in deep water, or in a state of constant submersion.

It is widely—but not very generally or abundantly—distributed over England and Wales: the following localities are all of which I have made memoranda.

ANGLESEA.—Mr. Wilson informs me he has found it at Llanfaelog, in this county; and the Rev. Mr. Davies says that it occurs in spongy meadows and ditches.

CAERNARVONSHIRE.—Mr. Babington informs me he has found it in Llanberis lake; and Mr. Wilson in Llyn Idwel.

Cheshire.—I am indebted to Mr. Sidebotham for specimens collected on Baguley moor. Mr. Wilson informs me he has found it on Bartington heath, and in other places; and Mr. Pinder at Woove. "Beam heath, near Nantwich: Mr. J. E. Bowman."—*Francis' Analysis.*

Cornwall.—I learn from Mr. Ralfs that it grows on Chy-an-hal moor and Marazion marsh near Penzance.

Devonshire. — "Wet places on Blackdown: Polwhele." — *Botanist's Guide.*

Dorsetshire. — "By the road-side, in inundated places between Corfe Mullein and Poole, at about the 11th milestone; between Woodbury hill and Wareham; and about Sandford bridge, near Wareham; about the salt-pits at Poole, and at Lymington: Pulteney."—*Botanist's Guide.*

Glamorganshire. — "Pen-Craig-y-Llyn-Vach, a mountain pool near Pont Nedd Vechn: Mr. J. Woods, jun."—*Bot. Guide.*

Middlesex.—"On Hounslow heath, towards Hampton: Ray. On Hillington common: Dr. Smith."—*Botanist's Guide.* "Iver heath."—*Francis' Analysis.*

Norfolk.—Mr. S. P. Woodward informs me that Mr. Wigham has found it on St. Faith's Newton bogs, and Mr. J. Paget near Filby broad.

Northamptonshire. — "Borough fen near Peterborough: Blackstone."—*Botanist's Guide.*

Northumberland.—I am indebted to the Botanical Society of London for specimens collected by Mr. Bowman in this county. "By the side of a pond near Woolsingham: Mr. Waugh and Mr. Thornhill."—*Botanist's Guide.*

Pembrokeshire. — Mr. Lees observed it at the head of a stream at St. David's head.

Radnorshire. — Mr. Westcombe informs me he found it in Rhos Goch near Llandegly.

Shropshire.—"Bomere pool: Rev. Mr. Williams." — *Francis' Analysis.*

Somersetshire.—"Wet places on Black and Maiden downs." —*Sole's Flora of Somersetshire.*

Suffolk.—Mr. Stock informs me it has been found on Hopton common.

Surrey.—Mr. Watson informs me he has found it in a small pond on Esher common, nearly opposite the front door of Claremont; Mr. Luxford has seen it in pools near Woodhatch and Earlswood common, below Reigate, where it was first found by Mr. Peter Martin; and Mr. Kippist has obligingly presented me with specimens which he collected in a small pond at Walton-on-the-Hill.

Sussex. — Mr. Borrer informs me that it occurs in many localities in this county, chiefly on wet commons and places occasionally overflowed; Mr. E. Jenner gives me Piltdown, Chailey North common, Quaybrook near Forest row, and Chiltington common, as localities. I am indebted to Mr. Jenner for Sussex specimens.

Warwickshire. — The Rev. W. T. Bree and a number of botanists have given me Coleshill pool as a locality: it grows both under water and on the margin of the pool.

Yorkshire. — Mr. S. Gibson informs me that it grows on Stockton common near York, Scarborough mere, &c.; Mr. Ibbotson on the margin of Gormire pool near Thirsk; and Mr. Teesdale says it occurs at Terrington carr, and on other watery heaths.

The following Scotch habitats are all that I possess.

Aberdeenshire. — I am indebted to the Botanical Society for specimens from the Loch of Drum, collected by Mr. Dickie.

Dumbartonshire. — I learn from Mr. Gourlie that Mr. Murray found it on the shores of Loch Lomond.

Dumfriesshire.—I learn from Mr. Cruickshank that it occurs in wet places where water has stood during the winter.

Edinburghshire. — I am indebted to Dr. Balfour for specimens collected on the Pentland hills. Professor Graham informs me it grows in great abundance in pools which are occasionally dry, on the side of the Pentland hills near Currie, about seven miles from Edinburgh, and in similar pools on the Greenlaw road, about five and a half miles from Edinburgh.

Forfarshire. — "Near Slateford: Mr. Brand." — *Francis' Analysis.*

Kirkcudbrightshire.—Mr. Cruickshank has found it on the margin of a pond in the grounds of Linchiden.

Lanarkshire. — Mr. Gourlie informs me that Mr. Ure found the Pillwort near Rotherglen, in this county.

Sutherlandshire. — Professor Graham informs me he has gathered it in great abundance in a ditch by the road-side, three miles above Invershinn, towards Oikel.

In Ireland it appears to be a plant of rare occurrence. I give the only localities I find recorded.

Antrim.—"Abundant in marshy ground about two miles from the mouth of the Blackwater, near Lough Neath : Mr. J. Campbell. In a ditch by the river Bann, a little below Jackson's Hall, Coleraine : Mr. David Moore." — *Mackay's Flora Hibernica.*

Galway. — It appears from Dr. Wade's 'Plantæ Rariores' that the Pill-wort has been found near Ballinahinch, in this county.

The figures of this plant are generally characteristic, but nearly all of them err in not representing it sufficiently slender; the best I have seen are those by Bernard de Jussieu, published in the 'Mémoires de l'Académie Royale des Sciences,'* and by Mr. Valentine, in the 'Transactions of the Linnean Society.'† The Linnean name of *Pilularia globulifera* appears to have been adopted by all subsequent writers.

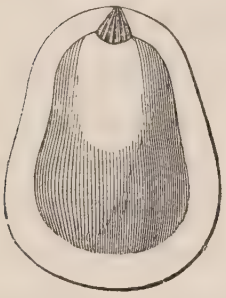
The roots are generally two or three inches in length, very flexible, slender, and but slightly branched; they are hollow, and divided by several longitudinal septa; they appear to descend perpendicularly into the mud or moistened earth in which the plant is found : they spring from a creeping rhizoma, which is also hollow and longitudinally divided; it is very slender and cylindrical, and the terminal or growing portion is invariably covered with a close investment of scales or scale-like hairs; these, like a similar investment common to the creeping rhizomas of *Polypodium vulgare*, *Davallia canariensis*, *Trichomanes speciosum*, and several other ferns, fall off with age, leaving the rhizoma perfectly naked and smooth. The roots spring from the rhizoma at intervals of considerable regularity, usually measuring about the third of an inch : they are generally three

* Mem. Acad. Roy. 1739, tab. 11. † Trans. Linn. Soc. xviii. tab. 35.

or four in a cluster, and immediately above them rise an equal number of erect, slender, smooth, setiform, pointed leaves: these are hollow like the roots and rhizoma; they are rather longer than the roots, and when they first make their appearance are rolled up in a manner precisely analogous to that exhibited in the circinate vernation of ferns. At many of the points of the rhizoma whence spring the leaves and roots, it also emits a small lateral branch, which bears leaves and roots at intervals like the parent rhizoma; and when this, in the course of nature, decays, these lateral branches continue vigorous, and become the nuclei whence future plants originate. The lateral branches occur with great regularity alternately on the right and left of the parent rhizoma; in proportion to their distance from the terminal point of the rhizoma these lateral branches increase in length, and the angles at which they join it become more and more obtuse.

The capsule is placed on a short stalk in the axil of the leaves: when full grown it occasionally attains the size of an ordinary peppercorn, and is nearly spherical, but slightly elongated at its apex; it is closely covered with a dense investment of hair. When mature it opens at the apex, dividing longitudinally into four parts, each of which continues attached by its inferior extremity to the common footstalk. Each of these four parts is hollow, and its cavity, which retains the figure of a quarter sphere, is, according to Jussieu, filled with an hermaphrodite flower composed of stamens and pistils arranged on a common placenta. This placenta is a membranous band attached to the interior spherical portion of the membrane which invests the capsule. The pistils are ranged on the inferior part of the placenta, and consequently occupy the lower portion of the common receptacle, as exhibited in the annexed cut, which is copied, with some slight alterations, from Mr.

Valentine's figure.* The shaded bodies represent the so-called pistils of Jussieu, and one of these detached is represented below, with its gelatinous covering, the result of immersion in water. The upper part of each cell is occupied by smaller granules, which are described as stamens, but this appears a somewhat vague conjecture, their office as such never having been clearly proved. Whatever may be the correct designation of the larger granules in their earlier state, it is quite certain that they ultimately become true seeds; for both the authors quoted have succeeded in tracing their germination, and have recorded their observations on the subject with a close correspondence which mutually proves their accuracy and precision; the improvement in the structure of microscopes, and the more artistical drawing of Mr. Valentine, giving however a decided superiority to his illustrations. These observations are made on the assumption that Mr. Valentine was entirely unacquainted with the contents of M. Jussieu's admirable essay, which, from an observation in his introductory remarks, I most readily believe.



According to Jussieu the seeds of *Pilularia* are to be found in the months of September and October, floating on the surface of the water, and germinating in that situation.

This germination of the sporules is minutely described by Mr. Valentine.—"The first external sign of germination is either the appearance of four cells projecting through the apex of the conical projection, or a gradual swelling of that part. * * The enlarging cellular mass then distends the conical projection, unfolding the plicæ of that body, and at length appears externally with four of its cells projecting beyond the general mass, and compressed into a quadrangular form. * * Soon after the exposure of the entire germ, which is effected by the reflection of the valves [of the internal membrane] and conical membrane over the side of the sporule, where they lie quite concealed by the germ, little fibrillæ or rootlets begin to shoot from one

* Trans. Linn. Soc. xviii. tab. 35, fig. 30.

side. They are simply articulated tubes, or elongated cells applied end to end, with frequently a bulbous extremity; and each is produced from one of the cells of the germ."* Shortly after the appearance of these rootlets the cells of the germ become flatter and more intimately connected with each other; and at the same time that part of the germ which closes the cavity of the sporule becomes hollow, and afterwards points in two places. These points gradually lengthen, and on dissection each will be found to consist of a closed sheath, one containing the first leaf and the other a root: these two apparently distinct sheaths communicate with each other, and envelope nearly the whole of the germ. The young leaf, when rather longer than the sporule, bursts through its sheath, and the root protrudes before it is as long as the sporule. "After the leaf has grown to be many times the length of the sporule, or about two lines long, another leaf grows from the germ close to the first, to which it is in all respects similar; and then a bud begins to be developed from some indefinite part of the germ, but like the leaves and root, from within the sheath, which is now frequently much lacerated. This bud is covered by a peculiar kind of jointed hairs, whose attachments are lateral, at a short distance from their bases, and which contain a few colourless granules. This bud sometimes appears after the first leaf, in which case there is no second primordial leaf formed; and is the rudimentary stem, the first growth from it being a leaf, which exhibits, although in a small degree, the first evidence of gyration, and shortly after a root, which is furnished with its own sheath. * * The roots are all formed in sheaths, through the apices of which they ultimately burst, the sheath continuing to embrace the base of the root, whilst a distinct and far more delicate sheath closely embraces its point."†

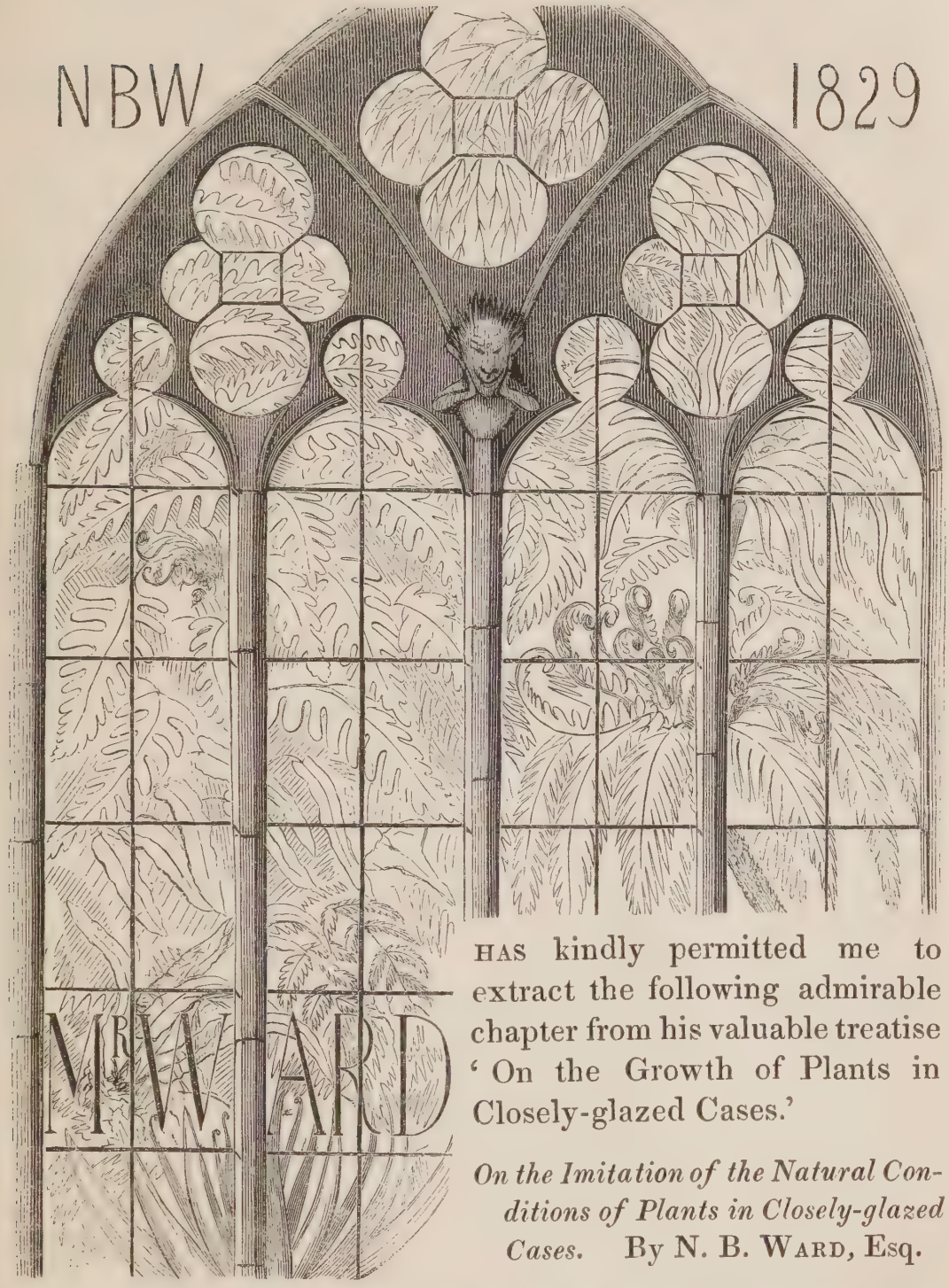
The following observations from the same source are well worthy the attention of botanists.—"This account of *Pilularia* shows that it is incorrect to say of Acrogens that 'germination takes place at no fixed point, but on any part of the surface of the spores;' for it is quite certain in this instance that germination

* Trans. Linn. Soc. xviii. 485. † Id. 487.

invariably takes place at a fixed spot, which may be pointed out before germination has commenced. It is at that part of the sporule indicated by the three radiating lines which appear to have been produced by the pressure of the three other sporules that originally helped to constitute the quaternary union; and as the spores of all the other tribes appear, according to Mohl, to be developed in similar unions, it is most probable that similar lines indicating a valvular dehiscence also exist on them. This is certainly the case in some mosses, for instance, in *Œdipodium*, and in *Isoetes*, *Lycopodium*, and *Osmunda regalis;* and in those instances where such a structure is not visible, it is probably owing to a thickening of the membrane, or a deposition of opaque matter on its surface, as in *Pilularia*. In the mature sporules of *Pilularia* they can only be discovered by dissection, and in the abortive ones they cannot be discovered at all after the first stages of their growth; whilst, again, the sporules of *Jungermannia complanata* exhibit similar lines after they have been submitted to the action of sulphuric acid. After the protrusion of the germ, however, it does appear to be quite immaterial from what part of the germ the first leaves, root or stem shall arise."

The 'History of British Ferns' ends here: the subsequent pages are almost entirely confined to extracts, which the author either considered too voluminous for foot-notes or accidentally overlooked: he trusts they will not be found wholly devoid of interest and utility. And now, gentle reader, the author takes his leave, hoping that when perusing his performance, when detecting occasional errors — and doubtless such there are — thou wilt make that kind and generous allowance which we should all accord to the *endeavour to do well.*

(A, p. xvi.)



HAS kindly permitted me to extract the following admirable chapter from his valuable treatise 'On the Growth of Plants in Closely-glazed Cases.'

On the Imitation of the Natural Conditions of Plants in Closely-glazed Cases. By N. B. WARD, Esq.

The science of Botany, in consequence of the perusal of the works of the immortal Linnæus, had been my recreation from my youth up; and the earliest object of my ambition was to possess an old wall covered with ferns and mosses. To obtain this end, I built up some rock-work in the yard at the back of my house, and placed a perforated pipe at the top, from which water trickled

on the plants beneath; these consisted of *Polypodium vulgare*, *Lomaria spicant*, *Lastræa dilatata*, *L. Filix-mas*, *Athyrium Filix-fœmina*, *Asplenium Trichomanes*, and a few other ferns, and several mosses procured from the woods in the neighbourhood of London, together with primroses, wood sorrel, &c. &c. Being, however, surrounded by numerous manufactories and enveloped in their smoke, my plants soon began to decline, and ultimately perished, all my endeavours to keep them alive proving fruitless. When the attempt had been given up in despair, I was led to reflect a little more deeply upon the subject, in consequence of a simple incident which occurred in the summer of 1829. I had buried the chrysalis of a Sphinx in some moist mould contained in a wide-mouthed glass bottle, covered with a lid. In watching the bottle from day to day, I observed that the moisture which during the heat of the day arose from the mould, became condensed on the internal surface of the glass, and returned whence it came; thus keeping the mould always in the same degree of humidity. About a week prior to the final change of the insect, a seedling fern and a grass made their appearance on the surface of the mould.

I could not but be struck with the circumstance of one of that very tribe of plants, which I had for years fruitlessly attempted to cultivate, coming up *sponte suâ* in such a situation; and asked myself seriously what were the conditions necessary for its growth? To this the answer was, — 1stly, an atmosphere free from soot; (this I well knew from previous experience): 2ndly, light: 3rdly, heat: 4thly, moisture: and lastly, change of air. It was quite evident that the plants could obtain light and heat as well in the bottle as out of it; and that the lid which retained the moisture likewise excluded the soot. The only remaining condition to be fulfilled was change of air; and how was this to be effected? When I published my account in the 'Companion to the Botanical Magazine,' I overlooked the law respecting the diffusion of gaseous bodies, described in the preceding chapter, and stated that this change was produced by the variations of temperature causing alternate expansions and contractions in the air surrounding the plants, and which of course produced a certain but very limited effect.

Thus, then, all the conditions necessary for the growth of my little plant were apparently fulfilled, and it remained only to put it to the test of experiment. I placed the bottle outside the window of my study, — a room facing the north,—and to my great delight the plants continued to grow well. They turned out to be *Lastræa Filix-mas* and *Poa annua*. They required no attention, the same circulation of the water continuing; and here they remained for nearly four years, the *Poa* once flowering, and the fern producing three or four fronds annually. At the end of this time they accidentally perished, during my absence from home, in consequence of the rusting of the lid, and the admission of rain water. Long before this occurred, however, I procured for the purposes of experiment some plants of *Hymenophyllum* and *Trichomanes;* and perhaps the most instructive way in which I can communicate the results of my enquiries will be to select a few out of numberless experiments, in the order in which they occurred. To commence with —

1. *Trichomanes speciosum;* (the *T. brevisetum* of most English botanical works). This, the most lovely of our cellular plants, is the most intractable under ordinary methods of treatment. Loddiges, who have had it repeatedly, never could keep it alive;* and Baron Fischer, the superintendant of the botanical establishments of the Emperor of Russia, when he saw the plant growing in one of my cases, took off his hat, made a low bow to it, and said—"You have been my master all the days of my life." Whence then arises the great difficulty of cultivating this plant? It is simply owing to the occasional dryness of the atmosphere. Place the plant in one of my cases, and thus secure a constantly humid atmosphere around it, and it will grow as well in the most smoky parts of London as on the rocks at Killarney, or in the laurel forests of Teneriffe:—

"Miraturque novas frondes."

This plant lived for about four years in a wide-mouthed bottle, covered with oiled silk, during which time it required no water; but having outgrown its narrow limits it was removed to some rock-work in my largest fern-house, where it now remains, covered with a bell-glass, and occasionally watered.

2. *Hymenophyllum, with one or two species of Jungermannia and Mosses.* These were planted nine years since, in the bottle in which my first experimental plants sprang up and perished. The soil is a mixture of peat mould, loam and sand, with as much moisture as it would retain when water was poured through it. This same water has served for the nourishment of the plants up to the present time, nor am I at present able to assign any limit to their existence in this state. The mould appears to be as moist and the plants as fresh, as on the day they were enclosed; and when we reflect upon their independent state, we may, without any great stretch of imagination, carry our minds back to the primæval condition of vegetation, when "the Lord God had not caused it to rain upon the earth, and there was not a man to till the ground. But there went up a mist from the earth, and watered the whole face of the ground."

This will be a fitting place to make mention of a small but most interesting bottle which I received in October, 1837, from Mr. Newman, superintendant of the Botanic Garden at the Mauritius. The bottle was filled with two or three specimens of a little species of *Gratiola* and of *Cotula*, and tightly covered with painted canvas. The plants were in full flower. I placed them in a window with a southern aspect: they remained in vigour for six or seven weeks, when one after the other declined, and eventually all perished without ripening any seed, in consequence of the too great humidity of the atmosphere. Before this took place I observed, as in my first experiment, several seedling ferns making their appearance between the internal surface of the glass and

* Mr. Mackay, of Dublin, I believe is almost the only person who has succeeded in growing this plant well; and to him I am indebted for my present specimens, and for numerous other kind contributions.

the mould, and therefore allowed the bottle to remain in the same situation, which it has occupied to the present time, the cover never having been removed; and it is now a truly beautiful object. The upper part of the bottle is completely filled with the fronds of two species of *Adiantum* and one or two other species of ferns, and the lateral surface of the mould is densely coated with seedling ferns in all stages.

We may learn a few useful lessons from this little bottle. We see how abundant the seeds of ferns are, and how easy it would be to procure many species of these plants from distant countries, by collecting here and there a handful of the surface-mould, and, at any convenient season, placing this in a condition favourable for their development. To those cavillers who are continually questioning me as to the utility of ferns in creation, I answer, that one of the useful purposes which they serve, in common with numerous other cellular plants, is that of furnishing mould in situations where other plants of a higher order could not at first grow; and this is effected in a two-fold way — by the decay of their fronds and the action of their roots. Mr. Webster, in his account of the voyage of the Chanticleer, states that in the course of his ramble in the Island of St. Catherine's, when gathering ferns, he was particularly struck by observing that each plant had formed for itself a bed of fine mould, several inches in depth and extent, whilst beyond the circle of its own immediate growth was naked rock; and this appeared so general that he could not help attributing the extraordinary circumstance to the disintegrating power of their fibrous roots,* which penetrated every crevice of the rock, and, by expanding in growth, appeared to split it into the smallest fragments.

Having determined the complete success of this mode upon more than a hundred species of ferns, and my ideas having a little expanded, I built a small house about eight feet square, outside one of my stair-case windows, facing the north; and, proceeding from ferns to those plants which live in their company, filled it with a mixed vegetation. This is called —

3. *The Tintern-Abbey House;* from its containing in the centre a small model, built in pumice and Bath stone, of the west window of Tintern Abbey. The sides are built up with rock-work to the height of about five feet, and a perforated pipe runs round the top of the house, by means of which I can rain upon the plants at pleasure. In the middle of summer the sun shines into this house for about one hour only in the morning, and about the same time in the evening, but not at all during the winter. There is no artificial heat. It contains at present about fifty species of British, North American, and other hardy ferns, *Lycopodium denticulatum*, *lucidulum* and *clavatum*, and the following flowering plants—*Linnæa borealis*, *Oxalis Acetosella*, *Primula vulgaris*, *Digitalis*

* The *Opuntia*, or Prickly Pear, when placed in fresh fields of lava, which, in the ordinary course of nature, — i. e. by the successive growth and decay of lichens, mosses, and other cellular plants, — would require a thousand years to become fertile, renders them capable of being converted into vineyards in the course of thirty or forty; and this by the comminuting action of its roots. Indeed, in all cases, the formation of mould may be traced to the double cause of the decay of dead vegetable matter and the splitting power of living roots.

purpurea, *Cardamine flexuosa*, *Lonicera Periclymenum*, *Meconopsis cambrica*, *Geranium robertianum* var. *flore albo*, *Dentaria bulbifera*, *Paris quadrifolia*, *Mimulus moschatus*, *Linaria Cymbalaria*, *Lamium maculatum*, and several others. All these flower well, but the atmosphere is too moist, and there is too little sun for them to ripen seed; with the exception of the *Mimulus*, the *Oxalis*, and the *Cardamine*, which latter grows with great luxuriance, and furnishes throughout the year a most grateful addition to the food of a tame Canary bird. The *Rhapis flabelliformis* and *Phœnix dactylifera* bore the cold during three winters in this house, when I was obliged to remove them in consequence of their size. A double white Camellia was also planted, about four years back, and blossomed tolerably well for three successive springs, but was killed by the last severe winter. In a cold house like this, but with an eastern or western aspect, so as to admit more solar light, I believe that Camellias would flower beautifully, and be far less likely to suffer from the winter's cold. The influence of light in enabling plants to withstand cold is far too little attended to, and in all cases where it is necessary to protect delicate plants in winter, light should be admitted, if possible. I shall next mention —

4. *The Alpine Case.* *Azalea procumbens*, *Andromeda tetragona*, *A. hypnoides*, *Primula minima*, *P. helvetica*, *Soldanella montana*, *S. alpina*, *Eriophorum alpinum*, and a few others, were the contents of my first alpine case. As I thought there would not be sufficient light at any of my windows, I placed the case on the roof of the house, and in the following spring all the plants flowered well except the Andromedas. Forgetting that an alpine summer is not so long as ours, I allowed the plants to remain fully exposed to the sun for the whole year, owing to which they became so exhausted that some died, and but few flowered in the ensuing spring. Warned by this, in my succeeding experiments on this interesting tribe of plants, I remove the case after their flowering into the coldest and most shady place I can find, until the following winter, when they resume their old position. In this way they flourish much better, but it is impossible to do them full justice, as we cannot give them the perfect rest which they require.

5. *Drawing-Room Case.* This case is at present filled in the bottom with two or three small Palms, some ferns, two or three species of *Lycopodium*, and several bulbous roots. Within, and along the roof of this case, runs a perforated bronze bar, from which are suspended small pots, containing *Mamillaria tenuis*, two or three species of *Cactus*, and one or two Aloes. In such a case as this it is easy to grow bog plants in the bottom and succulents at the top, these last never receiving any moisture but in the state of vapour, and that more abundantly when they most want it, viz. in the heat of summer. The distance between the surface of the mould at the bottom and the suspended plants does not exceed eighteen inches. The case stands in the window of a room with a southern aspect, and the thermometer in summer frequently rises to 110°, and even higher. This case requires occasional watering.

6. *Small Bottle with Mamillaria tenuis, a species of Cactus, and two or three fleshy species of Euphorbia.* This stands under the drawing-room case. The

plants have been enclosed four years; the mould consisting of very sandy loam. No water has been given since they were planted, and all are in a state of perfect health, although now outgrowing their narrow bounds.

7. *Crocuses and Winter Aconites.* Two cases were filled with roots of these plants; the one placed outside a window with a southern aspect, where there was plenty of light, but no artificial heat; the other in a warm room, where the light was very deficient. The plants in the former case exhibited a perfectly natural appearance,—their flowers were abundant and well coloured; while in the latter the leaves grew very long and pale, and not a single flower was produced.

8. *Crocuses with Artificial Light.* A case fitted up precisely as the two preceding was placed on my staircase, close to a gas lamp. The plants were covered during the day with a thick dark cloth, so as effectually to exclude day-light, and as soon as the gas was lighted the cloth was removed. The plants were thus exposed from five to eight hours daily to the influence of artificial light, accompanied with some degree of heat, while the remainder of the twenty-four hours was spent in a state of rest. The plants grew very well, the leaves not so much drawn up as those in the warm room, and the color more intense. One root flowered, the color of the flower being blue.

9. *Case with Spring Flowers.* In order to have a gay assemblage of flowers, I filled a case about three feet by one with the following plants, viz., *Primula sinensis*, *P. nivalis*, *Scilla sibirica*, *Cyclamen Coüm*, *Ornithogalum Sternbergii*, *Gagea lutea*, *Ganymedes pulchellus*, and three or four varieties of Crocus, interspersed with little patches of *Lycopodium denticulatum*. This case was placed, about the end of February, outside a window with a southern aspect. It is not, I believe, possible to see these plants to such advantage in an ordinary garden. Here, undisturbed either by wind or rain, their flowers are developed in the greatest luxuriance; and most of them continue for two or three months,* realising the beautiful description of Catullus:—

> "Ut flos in septis secretus nascitur hortis
> Ignotus pecori, nullo contusus aratro
> Quem mulcent auræ, firmat sol, educat imber,
> Multi illum pueri, multæ optavere puellæ."

10. *Fairy Roses.* I procured two of the smallest varieties of Fairy Rose, planted them in two tubs, in some good loam, with broken pots at the bottom, and then covered them with bell-glasses, the diameter of which was rather smaller than that of the tubs, and placed them outside a window facing the south, where they have now remained three years. These plants are as nearly as possible in their natural condition, very seldom requiring water, as the rain which falls runs over the glass through the mould. They begin to flower early

* The *Chorizema ilicifolium*, if placed in such a situation in the beginning of May, will continue to flower for four or five months; and cut flowers will last twice or thrice as long as in ordinary rooms.

in the spring, and continue for four or five months in great beauty, nothing more being required than to give them an occasional pruning.

It would be waste of time to detail any more of these minor experiments, and I shall therefore conclude by giving a short description of my largest experimental house. My object in this building was to obtain as many varied modifications of the natural conditions of plants as it was possible to procure in the small space to which I was confined.

The greatest length is twenty-four feet, width twelve feet, and extreme height eleven feet :—

"Exiguus spatio, variis sed fertilis herbis."

By building up rock-work to within a foot of the glass, and by varying the surface in every possible way, very different degrees of heat, light and moisture, are apportioned to the various plants. The house is heated in the winter by means of hot-water pipes, which preserve the lower portion during that season at a much higher temperature than the upper; the latter however has the advantage in the height of summer. The range of the thermometer throughout the year in the lowest part is between 45° and 90°, whilst at the top it is between 30° and 130°. Thus we procure, in a space not exceeding ten feet, an insular, and what may be called an excessive climate. There is no sunshine from the end of October to the end of March. In the lower portion are planted the following Palms :—*Phœnix dactylifera*, *P. leonensis*, *Rhapis flabelliformis*, *R. Sicrotsik*, a small but beautiful species from Japan, *Chamærops humilis*, *Seaforthia nobilis*, *Cocos botryophora*, *Sabal palmatus*, *Latania borbonica*, and one or two others. Among the ferns we have *Asplenium præmorsum*,* remarkably fine, *Diplazium seramporense*† (the *Asplenium pubescens* of Link), *Didymochlæna sinuosa*, and more than a hundred other species. Of Scitamineous plants, of which there are ten or a dozen species, the *Calathea zebrina* is the most conspicuous. The *Caladium esculentum*, and numerous other plants which do not require much sun, likewise grow in this part of the house. In the upper region are numerous species of *Aloë*, *Cactus*, *Bilbergia*, *Begonia*, &c. &c. Two or three varieties of rose likewise flower here, but neither so well nor so freely as in the cases already described. In hot summers the *Mimosa pudica* flowers freely, as do one or two species of *Passiflora*. In the intermediate spaces are *Disandra prostrata*, *Fuchsias*, and various other plants. From the roof are suspended numerous succulents and Orchideous epiphytes, but the temperature falls too low in the winter, and rarely rises sufficiently high in the summer, for these *splendid things without a foundation*,‡ so that they rarely flower. In a large vessel containing about twenty gallons of water, *Papyrus elegans* grows very well, as does *Vallisneria spiralis*, and some other aquatics. In addition to

* This is a valuable plant for such a house, as each frond lasts three or four years in perfection.

† This plant, which had been sterile at Loddiges for fifty years, produced a frond two years ago covered with fructification.

‡ The meaning of the name given to them by the South Sea Islanders.—*Williams.*

this great variety of living forms, this house contains a large and fine collection of *Lepidodendra*, *Calamites*, &c. &c., which, when compared with their recent types, the *Lycopodia* and *Equiseta*, are truly—

——— "of aspect that appears
Beyond the range of vegetative power."

Such are some of the results obtained in a temperate climate, and there cannot, I think, be a doubt that in tropical countries the application of this same plan might be equally striking and beneficial.

In ordinary horticulture a great deal is effected by closely imitating the natural conditions of plants. Thus my friend Dr. Royle, who has paid especial attention to this subject, informed me that there were certain plants in his garden at Saharunpore, which he could only keep alive by surrounding them with small trees and shrubs, so as to give them a moister atmosphere than they could otherwise have obtained; and he mentions in his beautiful work, the 'Illustrations of the Flora and Fauna of the Himalayas,' a striking example of this kind. — "To show the effects of protection and culture, *Xanthochymus dulcis* may be adduced as a remarkable instance. This tree, which is found only in the southern parts of India, and which would not live in the more exposed climate of Saharunpore, exists as a large tree in the garden of the King of Delhi; but here, surrounded by the numerous buildings within the lofty palace wall, in the midst of almost a forest of trees, with perpetual irrigation from a branch of the canal which flows through the garden, an artificial climate is produced, which enables a plant even so sensitive of cold as one of the *Guttiferæ* to flourish in the open air of Delhi, where it is highly prized, and reported to have milk thrown over its roots, as well as its fruit protected from plunder by a guard of soldiers."

Supposing ourselves in a hot and dry country, let us see what may be done by surrounding our plants with glass, and lowering the temperature, if required, by means of the evaporation of water from the external surface. We shall be enabled in this manner, as with the wand of a magician, to turn a desert into a paradise. The probable results cannot be better described than by copying the beautiful description of the palm-groves given us by Desfontaines, in his 'Flora Atlantica.'

"Palmeta radiis solis impervia, umbram in regione calidissima hospitalem incolis, viatoribus, æque ac animantibus ministrant. Eorum denso sub tegmine absque ordine crescunt aurantia, limones, punicæ, oleæ, amygdali, vites, quæ cursu geniculato sæpe truncos palmarum scandunt. Hæ omnes fructus suavissimos, licet obumbratæ ferunt; ibique mira florum et fructuum varietate, pascuntur oculi; simulque festivis avium cantilenis, quas umbra, aquæ, victus illiciunt, recreantur aures."*

* These palm groves, being impervious to the sun's rays, afford a hospitable shade both to man and other animals in a region which would otherwise be intolerable from the intense heat. And under this shelter the orange, the lemon, the pomegranate, the olive, the almond, and the vine, grow

There are many other situations where these cases would be useful, as on ship-board or in other places where there exists a necessity for economizing water, or in very cold countries, where it is equally necessary to make the best use of the little sun they possess and to protect the plants from cold winds. The cabbages of Iceland and Labrador would surely exceed their present size of about one or two inches in diameter if thus protected.

To conclude with a few general observations.

The advantages of this method of growing plants consist, first, in the power we possess of freeing or sifting the air from all extraneous matters ; — then of imitating the natural condition of all plants, as far as the climate we are living in will enable us so to do ; and of maintaining this condition free from those disturbing causes to which plants are oftentimes subjected from sudden variations of weather. They are preserved of course from the excess or deficiency of moisture, and, owing to the perfectly quiet atmosphere with which they are surrounded, they are able, like man, to bear extremes of heat and cold with impunity, which in ordinary circumstances would destroy them. The experiments of Sir Charles Blagden and others, in heated ovens, are well known, and the performances of Chaubert are familiar to most of my readers. In these instances the immunity is owing to the aqueous exhalations from the surface of the body remaining undisturbed, and acting as a protecting shield. In like manner the *Trichomanes* lived for three years, in a window with a southern aspect, exposed continually to a heat which, without the glass, would have destroyed it in a single day. With respect to cold, the concurrent testimony of all arctic voyagers proves that no inconvenience is felt, even at 70° below zero, provided the air be perfectly still ; but, that if wind arose, although the thermometer generally rose rapidly with the wind, the cold then became insupportable. We need not go to the Pole for illustrations of this fact. Every one has felt the difference between walking with his face or his back to one of our east winds in March, those winds which are often so destructive to vegetation in the open air, but have not the slightest effect on enclosed plants. I need not say anything respecting the change of air, as, from the contents of the preceding chapter, it must be obvious that as soon as any gas is generated within the case different to the atmosphere without, diffusion immediately commences, and no mode of closing the cases which I have adopted can prevent this from taking place.

As regards the cases in which these plants are grown, their shape or size may be adapted to the situations in which they are to be placed. The best cover for the smaller ones is, I think, the oiled silk of which bathing-caps are made, or

---

in wild luxuriance, producing, notwithstanding they are so shaded, the most delicious fruit. And here, while the eyes are fed with the endless variety of flowers which deck these sylvan scenes, the ears are at the same time ravished with the melodious notes of numerous birds, which are attracted to these groves by the cool springs and the food which they there find." — *Kidd's Bridgewater Treatise.*

thin sheet India-rubber. The frames of the larger cases should be well painted, and the laps so filled with putty as completely to exclude soot.

Do plants require water in these cases? — is a question frequently asked. This depends not only upon the nature of the plants, but upon the season of their growth. Almost all ferns, if enclosed in small cases where the water cannot escape, will continue to flourish for years, and I believe that a century might elapse without any fresh water being required. Cactuses, and most succulent plants, would be equally independent. In larger houses, where the surfaces are very varied, the water will drain from the upper parts, and fresh supplies will occasionally be wanted. If we wish our plants to grow with greater or less luxuriance, we have of course, at all times, the power to give or withhold water. Numerous plants require to be well supplied with water up to and during the period of inflorescence, and when the flowering is over to be kept nearly dry. This is easily effected by removing the cover, and allowing the moisture to evaporate by exposure of the case for a short time to the sun. It is desirable that there should be an opening in the bottom of the cases for the purpose of draining off the superfluous moisture, and likewise of giving us the opportunity of washing the mould with lime water should slugs make their appearance, which sometimes occurs. With respect to the mould, it is perhaps best to select that in which the plants which are to be the subject of experiment ordinarily grow; but this is not a matter of so much moment as is generally imagined. It is a very common impression that great knowledge of Botany is required before any successful attempts at the cultivation of plants in closed cases can be made; now, it must be obvious, from all that has been said, that whether the plant be grown in a closed case or in the open air, the natural conditions must be fulfilled to ensure success Again, many complain that the enclosed plants frequently become mouldy; this arises either from excess of moisture or deficiency of light, or a combination of both causes producing diminished vital action, or else from the natural decay of plants. It is very interesting to watch the progress of this. The moment a plant begins to decay it is no longer of any use; and those small parasitical fungi, commonly called moulds, are some of the means employed by nature in removing that which has now become an encumbrance: — "cut it down, why cumbereth it the ground?"

The simple circumstance which set me to work must have been presented to the eyes of horticulturists thousands of times, but has passed unheeded in consequence of their disused closed frames being filled with weeds, instead of cucumbers and melons; and I am quite ready to confess, that if some groundsel or chickweed had sprung up in my bottle instead of the fern, it would have made no impression upon me.

(B, p. 29).

Description of Equisetum hyemale, Mackaii and variegatum, as found on the banks and in the bed of the River Dee. By J. B. Brichan. (From 'The Phytologist,' p. 369).

Equisetum hyemale.

Root creeping, jointed, branched. Stems several from one branch of the root, or branched at the base, one to three feet high, or upwards, stout, erect or decumbent, articulated and fluted, occasionally throwing out catkins or very small branches near the top. Ridges or furrows fourteen to twenty-one in number, in luxuriant specimens twenty-eight; ridges grooved, and, as well as the furrows, grained like a file. Sheaths widest at top, at first pale green, with a black crenate rim; afterwards entirely black; ultimately white, with a broad black band at the base, the rim remaining black as before. The uppermost sheaths of the root *generally*, and the upper and lower of the *younger* stems *occasionally*, bear black, membranous, flexuose, deciduous teeth or bristles. The sheath of the catkin is invariably and persistently toothed. Catkins terminal, more rarely lateral, and in that case either single or in opposite pairs.

Equisetum Mackaii.

Root creeping, jointed, branched. Stems several from one branch of the root, or branched at the base, slender, often filiform, erect or decumbent, one to two and a half feet high, consisting of articulations from one to two and a half inches in length. The older stems frequently throw out long slender branches, which generally bear catkins. The stems are fluted, the ridges grooved, and both ridges and furrows grained, as in E. hyemale. Number of ridges or furrows eight to twelve. Sheaths cylindrical, at first pale or yellowish green, with a narrow black band immediately under the teeth; ultimately wholly black, with the lower border of the black entire. Teeth equal in number to the ridges, membranaceous, white at the edge, long and tapering, terminating in a flexuose bristle which is generally black but sometimes white, in which case the white margin of the teeth is broader: they often adhere in pairs, and are decidedly persistent. Catkins terminal, either on the stems or on the branches.

Equisetum variegatum.

Root creeping, jointed, branched. Stems many, three to twenty inches long, branched at the base and upwards, generally but not invariably decumbent and filiform, rather brittle, consisting of numerous fluted articulations, half an inch to an inch and a half long. Ridges or furrows five to nine, the former grooved, and both grained as in E. hyemale and E. Mackaii. Sheaths slightly swollen upwards, the upper half black. Lower border of the black waved or toothed, the

dentations alternating with the teeth, and, like them, equal in number to the ridges. The teeth are distinct, never adhering, obtuse, somewhat ovate, black in the centre, with a broad, white, membranous margin, and tipped with a short bristle, which is either black or white, and more or less deciduous, while the teeth themselves are persistent. Catkins terminal, rather large in proportion to the size of the plant.

These descriptions are intended to apply to the plants only "as found on the banks and in the bed of the river Dee," and as seen either with the naked eye or through a small lens. I have endeavoured to exclude everything that could not with propriety be admitted as a specific distinction. The characters which I have given, and which I find to be constant, * * * have led me to the conclusion that the three plants are well entitled to be ranked as distinct species. I conceive that the main strength of my position lies in the fact, that amidst all the varieties of size and shape which each plant presents, the distinctive characters remain the same. The species never *shade off* into one another, the smallest specimen of the largest species being readily distinguished from any specimen of the other two; while, on the other hand, the stoutest stems of E. Mackaii and variegatum can at once be recognized as distinct from each other, and from the slenderer stems of E. hyemale.

(C, p. 44).

Observations on the Linnean Specimens of Equisetum. By Edward Newman. (From 'The Phytologist,' p. 530).

It is, I believe, generally known that the Linnean herbarium was purchased by Sir J. E. Smith, and subsequently by the Linnean Society of London, in whose possession it now remains. The specimens are fixed on half sheets of foolscap paper; they are named by Linneus himself, in his own handwriting, and have also the comments of Sir J. E. Smith, wherever it appeared to him necessary or useful to add an explanatory note. A few labels with MS. notes are pasted in, but I am not certain of their author. The Equiseta are comprised in a fasciculus of nine folios: the fasciculus is endorsed thus, — "1169, Equisetum," in the handwriting of Linneus.

In the same apartment are preserved the author's own copies of the first and second editions of the 'Species Plantarum.' In the first all the species possessed by the author are distinguished by a particular mark; and the second is enriched with his own unpublished notes. I will now endeavour to combine the information obtained from these several sources, only quoting the *published* characters when requisite, and adding remarks of my own on every specimen.

FOLIO 1.

Linneus.—1. sylvaticum.

E. N.—A single young specimen of Eq. sylvaticum of Smith, with a very perfect catkin.

FOLIO 2, pinned by Linneus to the preceding.

E. N.—Two mature specimens of Eq. sylvaticum of Smith, without fructification.

FOLIO 3.

Linneus.—2. arvense.

Anonymous.—1061. Equisetum setis ramosis. Equisetum verticillis ad folia numerosis. Hall. Stirp. Helv. 144. Equisetum sylvaticum, tab. p. 253.

E. N.—Two specimens: right hand, a fertile specimen of Eq. arvense of Smith, with perfect catkin; left hand, a mature specimen of Eq. sylvaticum of Smith, without fructification.

FOLIO 4, pinned by Linneus to the preceding.

Linneus.—Hispania, 713. Loeft.

E. N.—Three specimens without fructification, all of them apparently starved or distorted: they probably belong to the Eq. arvense of Smith. The Linnean MS. is on the back of the folio.

FOLIO 5.

Linneus.—3. palustre.

Smith.—?.

Anonymous.—1060. Equisetum setis simplicibus. Equisetum minus terrestre. I. B. M. p. 730.

E. N.—Two specimens without fructification, and in a very unsatisfactory state of growth: right hand appears to me to be Eq. arvense of Smith; left hand is perhaps Eq. palustre of Smith.

FOLIO 6.

Linneus.—4. fluviatile.

Linneus, [Sp. Plant.*] — Fluviatile 4. Equisetum caule striato frondibus subsimplicibus; [here follow the synonymes]. *Habitat in* Europa *ad ripas lacuum fluviorum.* 2*l*.

———. [MS. addition over the word *striato*], an striato?

———. [MS. addition on the opposite page, the copy being interleaved, and in allusion to a reference to Haller]. Hoc caules proliferos a sterilibus definiter profert. Hall. [The passage in Haller is this—" Caulis floriger videtur a folioso remotus."†]

* Sp. Plantarum, 1517. † Haller, Helv. 144.

Linneus.—[MS. addition below the preceding]. Forte mera varietas prioris [palustre] ex solo aquæ profundioris.

Smith.—limosum ? Certè.

E. N.—Four specimens, all with catkins, and identical with Eq. limosum of Smith. As there is no representative of Eq. limosum of Linneus, and as the marked copy of the work indicates that he did not possess it, I subjoin the character.

Linneus.—[Sp. Plant.] Limosum, 5. Equisetum caule subnudo lævi, [here follow the synonymes]. *Habitat in* Europæ *paludibus, turfosis, profundis.* 2*l*.

———. [MS. addition on the opposite page]. Hallerus hanc facit varietatem E. palustris.

E. N.—It is clear that Linneus trusts to Ray as the authority for this as a distinct species, since he quotes his figure,* which evidently represents the unbranched form of Eq. limosum of Smith. Hence it seems that Eq. fluviatile of Linneus is the branched, and Eq. limosum the unbranched form of Eq. limosum of Smith; and that Eq. fluviatile of Smith has no representative either in the herbarium or the works of Linneus. With respect to the observation of Linneus quoted above, that Haller makes this species a variety of Equisetum palustre, I think the criticism is an unjust one. Haller quotes Ray's figure 3, and, as it seems to me, correctly, as a variety of Equisetum palustre; while Linneus quotes Ray's figure 2, which is evidently the Eq. limosum of Smith. A positive proof that the fluviatile of Linneus was not the fluviatile of Smith, exists in the fact that he attempted to account for its increased size and altered appearance by its growing from the bottom of deep water: this is the case with Smith's limosum, but never with his fluviatile, which, on the contrary, affects loose gravelly and sandy places unconnected with water.

Folio 7.

Linneus.—Œdific.: hyemale.

———. [Sp. Plant. MS. addition on the opposite page]. Equisetum caule simplici aspero vaginis non laciniatis. Hall. Helv. 143.—Caulis viridis scaber, radiis [?] vaginæ pallidæ basi marginisque denticulis obsoletis atris gibbis.

E. N.—A single specimen of Eq. hyemale of Smith. The word or abbreviation "Œdific." implying its uses, is written apart from the name.

Folio 8.

Linneus.—Tourelle.

Smith.—Asperrimum, Dick., variegatum, Jacq. H. B.—J. E. S.

Anonymous.—Equisetum basiliense, No. 1678, haller. An species distincta apud cl. linn.? In horto cultum.

E. N.—A single specimen of Eq. variegatum of Smith. Linneus answers the question as to its being a distinct species, by giving basiliense as a syno-

* Syn. t. 5, fig. 2, *a*, *b*.

nyme of hyemale (Phytol. 338). The word "Tourelle" written by Linneus is probably a habitat.

Folio 9, pinned by Linneus to the preceding.

Linneus.—Suec.

E. N.—A single specimen of Equisetum variegatum of Smith, much more slender than the preceding: the Linnean MS. evidently implies the habitat, Sweden.

I think the above notes will be sufficient to show that as regards several species of Equisetum, more especially the present, generally known as palustre, the Linnean herbarium is not a sure guide. There is, however, much collateral evidence that Linneus was not only acquainted with the Equisetum palustre of modern authors, but that he referred to that species when he named the plant in question; for he expressed states that his fluviatile (Smith's limosum) may be a variety of palustre growing in deeper water. Now as he was so well acquainted with fluviatile (Smith's limosum), and possessed such good specimens, his judgment cannot be supposed so much in fault as to have referred it to arvense. The error must have arisen from a want of care in the selection of specimens for his herbarium. Moreover, the name palustre is now too universally employed to admit of its being changed, without a better reason than a discrepancy which may have originated in carelessness. The same is not the case with fluviatile: I am decidedly of opinion that the name, in this instance, must be changed; and I make the proposition previously to publishing the species, in order that I may be favoured with the opinions of those botanists who think otherwise. I propose restoring the Linnean name to the limosum of Smith, and sinking the name limosum to the rank of a variety; thus: —

Equisetum fluviatile, Linn. = *Equisetum limosum*, Smith.
„ „ β. *limosum*, with the stem quite simple, = *Equisetum limosum*, Linn.

The species hitherto called fluviatile is already so well provided with names that it is difficult to determine which to select. It seems to be the Equisetum majus of Gerarde* and Ray,† the Eq. Telmateia of Ehrhart‡ and Flora Danica,§ and the Eq. eburneum of Roth.‖

* Ger. Em. 1113, f. † Ray, Syn. 130.
‡ Ehr. Beitr. ii. 159. Crypt. 31. § Flora Danica, tab. 1469. ‖ Roth, Cat. i. 129.

(D, p. 141).

On Woodsia, a new Genus of Ferns. By Robert Brown, Esq., F.R.S., Lib. L.S. (From the Linnean Transactions, xi. 170).

There is perhaps no tribe of Cryptogamous plants which, since the time of Linneus, has received greater additions to its number of species, or more considerable improvements in its systematic arrangement than the *Filices:* and certainly no botanist has so essentially contributed to those improvements as the President of this Society; whose ingenious 'Essay on Dorsiferous Ferns' may be justly considered as the groundwork of the more complete dissertations of Professors Swartz and Bernhardi, which have appeared since its publication.*

Linneus, in his latest work, the 13th edition of the 'Systema Vegetabilium,' enumerates scarcely more than two hundred ferns, which he referred to twelve genera: while the 'Species Plantarum' of the late Professor Willdenow contains upwards of a thousand plants of the same order, arranged under forty-three genera. It is, however, remarkable, that of this vast number of species nearly one half belong to four of the Linnean genera, namely, *Polypodium*, *Acrostichum*, *Asplenium* and *Pteris*, all of which were first proposed by Ray in his 'Methodus Plantarum Emendata,' published in 1703; without names indeed, but with characters nearly similar to those of Linneus.

It appears, therefore, that the arrangement of Ferns at present universally followed is not wholly new: and that it has not attained such a degree of perfection as to supersede all changes in nomenclature, may be inferred from the genus *Polypodium* alone, though reduced nearly one-half by its present character, still including a hundred and fifty seven species, or upwards of a seventh part of the whole order.

The expediency of subdividing *Polypodium*, as well as some of the other genera mentioned, especially *Acrostichum*, is indeed obvious, not merely on account of their great extent, but also from the striking differences in habit existing among the species referred to each.

I have some time ago† had an opportunity of remarking that two plants referred to *Polypodium* — *P. ilvense* and *hyperboreum*, form a distinct genus from the peculiar structure of their involucrum, even the existence of which had escaped preceding observers.

This genus I have named in honour of my friend Mr. Joseph Woods, whose merits as an accurate and skilful English botanist, are well known to many of the members of this Society: and the object of the present communication is to

* An. 1794, in Mem. de l'Academie Royale des Sciences de Turin, v. 401.

† Prodr. Fl. Nov. Holl. i. 158. Obs. iv.

illustrate it by some additional observations on its structure, and by a very perfect drawing, for which I am indebted to the friendship of Mr. Francis Bauer.

The character distinguishing *Woodsia* from all other genera of Ferns hitherto established, consists in its involucrum being inserted under the group of capsules, or, as it is technically called, the *sorus*, which it completely surrounds at the base, while it is in every stage open at the top, having its margin divided into a number of capillary segments, which from their length and incurvation entirely conceal the young capsules, and in a great measure the full grown.

That so singular a structure should have been hitherto unnoticed, even though both species of the genus have been described and figured since the publication of Dr. Smith's memoir, is not perhaps to be wondered at; for the membranaceous base of the involucrum is completely concealed by the capsules, and the marginal hairs, which alone are visible, exactly resembling the pubescence of the frond, have been universally confounded with it.

The difficulty, too, of separating the membrane entire from the frond, to which, by the pressure of the capsules, it is closely applied, is so considerable, that since the publication of my remarks already quoted, its existence has been doubted by a botanist whose opinion—especially in whatever regards this order of plants—is of peculiar weight, and in opposition to which I should not retain full confidence in my own observations, though frequently repeated, were they not so distinctly confirmed by Mr. Bauer's excellent drawing.

I first observed the involucrum six years ago in living plants of *Woodsia hyperborea*, and have since repeatedly ascertained its existence in dried specimens of the same species, and of *Woodsia ilvensis*. These two plants are indeed so nearly related, that I find myself unable to construct for them clear specific characters; and therefore, in proposing them here as distinct species, I am, from want of sufficient materials to determine the question, rather following the prevailing opinion than my own.

(E, p. 158).

Descriptions of European species of Cistopteris. By Roth. (From the Flora Germanica, iii. 94),

1. *Cyathea fragilis.* C. frondibus &c.

Frondes plures ex una radice crassiuscula, fusca, cæspitosa, digitales, spithameæ et semipedales, tenues, debiles, molles, oblongæ, e pallide luteo virides, glabræ, subpellucidæ, bipinnatæ: *pinnis* per paria approximatis, suboppositis, remotis, cordato-oblongis, obtusiusculis, patentibus, pinnatis: in *infimo pari* remotiore plerumque sterili brevioribus, basi latioribus, vix semiunciam longis; *mediis* longioribus, circiter uncialibus; *superioribus* angustioribus et in apicem frondis lanceolatum, obtusum, pinnatifidum decrescentibus. *Pinnulæ* alternæ,

distantes, remotiusculæ, cordato-ovatæ, vel ovales, apice obtusæ, rotundatæ et crenulatæ : *inferiores* in quavis pinna profundæ incisæ et ita pinnatifidæ ; *laciniis* ovatis, obtusis, ad apicem obsolete dentatis ; *superiores* inciso-denticulatæ. *Stipes* filiformis, tenuis, nitidus, admodum fragilis, supra medium nudus, rubicundus, infra frondem pallidior, basi subpaleaceus. *Involucrum* tenue : membranaceum, fuscum, calyciforme, ovato-turbinatum, in quavis pinnulæ lacinia ad sinum incisuræ solitarium, in inferioribus cujusvis pinnæ pinnulis ad laciniarum marginem duo, tria vel quatuor, in omnibus e venulæ lateralis apice originem ducens, capsularum acervulum in gremio suo tenens aucto demum capsularum volumine longitudinaliter dehiscens et effusis ad latus replicatum, persistens. *Capsulæ* exiguæ, subrotundæ, pedunculo longo, tenui, pallido, isthmis intercepto insidentes, fuscæ, *annulo* articulato, ex aureo et atropurpureo pulcherrime colorato cinctæ. *Semina* subrotunda, fusca, minuta.

2. *Cyathea regia.* C. frondibus &c.

Frondes plures ex una radice fusca, crassa, fibrosa, cæspitosa, debiles et fragiles, oblongo-lanceolatæ, utrinque attenuatæ, semipedales, pedales, raro longiores, glabræ, læte virides, subtripinnatæ : pinnis oblongo-lanceolatis, suboppositis, erecto-patentibus, basi semiunciam ad unciam latis, in *infimo pari* remotiore brevioribus, sesquiunciam ad duas longis ; *mediis* bi-aut triuncialibus ; *superioribus* magnitudine decrescentibus, angustioribus et acutioribus, demum in apicem frondis angustum, pinnatifidum desinentibus. *Pinnulæ* in inferioribus et mediis pinnis fere pinnatæ, ovato-lanceolatæ ; *laciniis* seu *foliolis* oblongo-lanceolatis, acutis, patulis, dissitis, margine argute incisis et denticulatis, basi tantum ala foliacea inter se cohærentibus ; in superioribus et summis pinnis profunde et argute incisæ pinnatifidæ ; *laciniis* linearibus, acutis, margine subintegris. *Stipes* filiformis, glaber e purpureo et aureo splendens, infra medium nudus, basi paleis raris adspersus. *Involucrum* membranaceum, membrana tenui, ferruginea et pulcherrime reticulata conflatum, calyciforme, exovato-turbinatum, e venulæ lateralis apice ortum ducens, in quavis pinnularum lacinia vel foliolo, exceptis superioribus et summis, quatuor ad sex, ad eorum incisuras collocatum, in summis pinnulis ad quamvis laciniam plerumque solitarium, capsularum acervum includens, demum ad latus secundum longitudinem dehiscens et dilaceratum tunc a capsulis effusis replicatum. *Capsulæ* subrotundæ, exiguæ, fuscæ, pedunculo breviori recto insidentes, *annulo* atropurpureo, articulato cinctæ. *Semina* minutissima.

3. *Cyathea anthriscifolia.* C. frondibus bipinnatis ; pinnulis ovatis, obtusiusculis, pinnatifidis ; laciniis crenato-dentatis.

Vix specie diversa videtur a *Cyathea fragili*, quoad specimina saltem in Cel. *Schraderi* collectione plantarum exsiccatarum cryptogamicarum, ab Ill. Praef. *de Schreber* et Cel. Prof. *Mertens* mecum benignissime communicata, quæ figuris Cel. *Hoffmanni* in Tabula Synopt. Filicum c. et e. Fig. 14. quoad dentes vel crenulas laciniarum minus respondet. Si quædam vero adsit differentia, consistet 1. *Statura* duplo fere majore. 2. *Pinnulis* præsertim inferi-

oribus in quavis pinna duplo longioribus et latioribus, profundius divisis et pinnatifidis: *laciniis* oblongis, obtusis et apice acutius inciso- vel crenato-dentatis. 3. *Fructificationibus* remotioribus et rarioribus. 4. *Involucro* albido.

4. *Cyathea cynapifolia.* C. frondibus &c.

Elegans atque tenera Filix. *Frondes* plures e radice crassiuscula, fusca, squamosa, semipedales ad pedalem longitudinem accedentes, pallide et amœne virides, debiles, flexiles, molles, texturæ herbaceæ, oblongæ, bipinnatæ: *pinnis* oblongis, obtusis, apicem versus attenuatis, approximatis, alternis vel suboppositis. *Pinnulæ* alternæ, ovales vel cuneiformes, obtusæ, distantes, patentes, venis eleganter striatæ, pinnatifidæ: *laciniis* oblongis, cuneiformibus, obtusis, erecto-patentibus, in inferioribus pinnarum pinnulis ad apicem margine uno alterove dente præditis, apice quasi oblique rescissis et inciso-denticulatis; in superioribus margine integris, apice obtusis, crenato denticulatis. *Stipes* filiformis, tenuis, nitidus, e viridi fuscescens, glaber, infra medium nudus, basi non raro oblique adscendens, ferrugineus. *Involucrum* calyciforme, exiguum, ovato-turbinatum, albidum, membrana tenuissima conflatum, e venulæ lateralis ad sinum laciniarum tendentis apice ortum ducens, in quavis lacinia ad interiorem basin plerumque solitarium, fructificationes includens, demum e basi ad apicem longitudinaliter dehiscens et capsulis effusis demum replicatum. *Capsulæ* perexiguæ, fuscæ, nitidæ, pedunculo brevi insidentes, *annulo* articulato, purpureo cinctæ.

5. *Cyathea alpina.* C. frondibus &c.

Planta tenera tenuissimeque divisa. *Frondes* digitales aut paulo longiores, oblongo-ovales, subtus totæ fructificationibus tectæ, supradecompositæ. *Pinnæ* triangulares, subtripinnatæ, alternæ, subacuminatæ, in infimo pare a reliquis remoto suboppositæ, breviore. *Pinnulæ* triangulares, duas ad tres lineas longæ, alternæ, distantes, patentes, obtusiusculæ, pinnatæ: *foliolis* oblongis, vage incisis, lineæ longitudinem circiter adæquantibus; *laciniis* semilinearibus, oblongis, angustis, margine integris, apice retusis et tenuissime bifidis. *Stipes* inferne nudus, teretiusculus, fuscescens, intra frondem cum nervis pinnarum et sequentium divisurarum complanatus, herbaceus cum linea decurrente pellucida, paleis capillaribus tenuissimis adspersus. *Involucrum* calyciforme, fuscum, in cujusvis laciniæ disco solitarium, e venulæ apice ortum ducens, membranaceum capsulis maturis in lacinias irregulares secundum longitudinem dilaceratum, demum capsulis effusis replicatum. *Capsulæ* sex ad decem in quavis involucro, perexiguæ, fusco-purpureæ, pedunculo tenui insidentes, *annulo* articulato atro-purpureo cinctæ, demum effusæ, tamen non confluentes.

(F, p. 242).

Descriptions of the species of Athyrium. By Roth. (From the Flora Germanica, iii. 61).

3. *Athyrium molle.* A frondibus &c.

Frondes nonnullæ ex una radice, bipedales et longiores, rhomboideæ, debiles, flexiles, molles, læte virides, glabræ, planæ, subbipinnatæ : *pinnis* omnibus lanceolatis, fertilibus, patentibus ; *inferioribus* suboppositis, remotioribus, *reliquis* externis approximatis : *duabus infimis* sequentibus inferioribus et mediis duplo fere brevioribus, apice in mucronem lanceolatum, tenuem, tenuissime denticulatum, obtusiusculum decrescentibus : pinnatifidis. *Pinnarum laciniæ* primo intuitu quidem distinctæ, basi tamen ad nervum pellucidum inter se tenui membrana cohærentes, omnes alternæ, patentes, fructiferæ, inferiores et mediæ vix ultra lineam latæ, et tres circiter lineas longæ, *inferiores* crenis marginalibus bifidis : terminalibus simplicibus obtusiusculis notatæ ; *mediæ*, excepta una alterave infima bifida, omnibus simplicibus distinctæ ; *superiores* sensim magnitudine decrescentes, margine integerrimæ, ad apicem crenulis quatuor vel tribus simplicibus præditæ ; *supremæ* versus pinnæ apicem integerrimæ, acutæ. *Stipes* filiformis, glaber, nitidus, inferne nudus, hinc convexus, inde exsulcatus. *Fructificationum puncta* ovata, intra costam et crenas in duplicem seriem oblique disposita, remotiuscula, opposita, paribus quatuor vel tribus, ferruginea, tecta *Involucro* ovato, e venula ortum ducente, paleaceo, ferrugineo, pellucido, venis anfractuosis pluribus pulcherrime picta, altero margine laciniato-fimbriato, introrsum versus costam elevato et demum represso. *Capsulæ* exiguæ, ferrugineæ longo pedunculo insidentes, *annulo* tenui atropurpureo articulato cinctæ, demum effusæ, tamen minus confluentes. *Semina* exigua, fusca, ovalia.

4. *Athyrium trifidum.* A. frondibus bipinnatis ; pinnulis semidecurrentibus, incisis lanceolatis ; laciniis apice conniventi-trifidis, stipite subpaleaceo. [A præcedente differt]

1. *Fronde* duplo longiore et latiore. 2. *Stipite* etiam intra frondem paleis linearibus, flexuosis, ferrugineis, raris adsperso. 3. *Pinnis* duplo latioribus, pinnatis. 4. *Pinnulis* distinctis, nec tenui membrana inter se confluentibus et connexis, tamen portione foliacea brevi ad nervum pinnæ semidecurrentibus, profundius incisis. 5. *Laciniis* majoribus, patentioribus : *infima* in quavis pinnula ad nervum sursum spectante paulo majore uno aut altero dente margine aucta ; *reliquis* margine integris, apice tridentatis : *dentibus* conniventibus, intermedio duplo longiore. 6. *Fructificationum punctis* duplo minoribus et remotioribus.

5. *Athyrium ovatum.* A. frondibus &c.

Frondes oblongo-ovales, sesqui ad bipedales, saturate virides, bipinnatæ, densæ ; *pinnis* lanceolatis, acuminatis, omnibus fertilibus, alternis ; *inferioribus*

paulo remotioribus, brevioribus, oblongis. *Pinnulæ* ovatæ, approximatæ, sibique fere contiguæ, tres ad quatuor lineas longæ et in medio sesquilineam-circiter latæ, distinctæ, tamen portione foliacea semidecurrentes, obtusiusculæ et dente brevi terminatæ, ad dimidium incisæ, *laciniis* apice quasi retusis; *inferioribus* in quavis pinnula margine uno alterove dente utrinque præditis, apice tridentatis, *dentibus* brevibus, obtusiusculis, subconniventibus; superioribus margine integris, apice bidentatis; *infima* in quavis pinnula ad nervum pinnæ sursum spectante maxime, oblonga, trifida. *Stipes* subflexuosus, maxima ex parte frondosus, cum nervis pinnarum subtus paleis linearibus, ferrugineis adspersus. *Fructificationum puncta* ovalia, in quavis lacinia ad nervum pinnulæ solitaria, ferruginea, majora quam in antecedentibus, tecta *Involucro* paleaceo, ferrugineo, ovato, e venula laterali, laciniæ nervo pinnulæ proximæ secundum longitudinem ortum ducente, introrsum ad nervum margine laciniato-fimbriato, demum capsulis maturis elevato et ab illis represso. *Capsulæ* exiguæ, ferrugineæ, annulo articulato cinctæ.

6. *Athyrium Filix-femina.* A. frondibus &c.

Frondes spectabiles, ultra bi-seu tripedales et in medio non raro ad pedem fere latæ, densæ, plerumque saturate virides, debiles, bipinnatæ: *pinnis* alternis, patentibus, oblongo-lanceolatis; *inferioribus* minoribus; *mediis* maximis, palma longioribus; ad apicem frondis decrescentibus in mucronem tenuem, longum, denticulatum; *omnibus* plerumque fructiferis, pinnatis. *Pinnulæ* oblongo-lanceolatæ, alternæ, approximatæ, tamen sibi non contiguæ, sed patentes, nervis pellucidis pictæ, *inferiores* ad stipitem frondis majores, circiter unciales, *sequentes* sensim magnitudine decrescentes in apicem longum, tenuem, denticulatum, ad nervum usque fere iterum divisæ et ita pinnatifidæ: *laciniis* subopositis, oblongis, patentibus, margine in inferioribus præsertim incisuris quibusdam argutis, denticulatis, denticulis acutis; inferioribus in quavis pinnula apice plerumque tridentatis, superioribus bidentatis; *infima* ad nervum pinnæ sursum spectante reliquis duplo majore, margine evidentius argute inciso-dentata, apice plerumque dentibus quatuor terminata. *Stipes* subflexuosus, hinc convexus, inde sulcatus, paleis fuscis, lanceolato-linearibus etiam intra frondem sed rariter adspersus, maxima ex parte frondosus. *Fructificationum puncta* majora quam antecedentibus, in quavis pinnulæ lacinia solitaria, ad interiorem marginem collocata, hinc in duplicem seriem in quavis pinnula paribus sex ad novem disposita, ovalia, tecta *Involucro* ovali, paleaceo, ferrugineo, e venula in primum lateralem et nervum pinnulæ respicientem dentem, tendente, lateraliter ortum ducente, altero, opposito et ad nervum pinnulæ tendente margine, laciniato-fimbriato, demum elevato et effusis capsulis tunc represso, semilunari. *Capsulæ* exiguæ, subrotundæ, ferrugineæ nitidissimæ, pedunculo versus basin attenuato insidentes, *annulo* articulato, atropurpureo cinctæ, demum effusæ et non raro ultra dimidiam laciniæ paginam inferiorem tegentes. *Semina* minuta.

7. *Athyrium rhæticum.* A. frondibus &c.

Frondes plures e radice atra, crassa, sesquipedales et bipedales, oblongo-

lanceolatæ, utrinque attenuatæ, rigidiusculæ, læte vel saturate virides, bipinnatæ : *pinnis* lanceolatis, remotis, angulo obtuso egredientibus, patentibus, basi plerumque depressis, in longum, tenuem et serratum mucronem decrescentibus : *infimis* minimis, alternis, decurvis, vel reflexis cum *inferioribus* sensim majoribus oppositis vel alternis sterilibus ; *reliquis* alternis, fertilibus, sensim magnitudine decrescentibus in mucronem serratum quoque fertilem. *Pinnulæ* in infimis sterilibus pinnis ala foliacea confluentes, in reliquis distinctæ, inferiores in quavis pinna oppositæ, superiores alternæ, steriles plerumque planæ, fertiles ut plurimum, præsertim ante capsularum plenariam maturitatem, replicatæ et ita pinnæ non raro conduplicatæ : *omnes* remotiusculæ, distinctæ, oblongo-lanceolatæ, tres, quatuor lineas ad semiunciam longæ, vix ultra lineam latæ, prona pagina nervis venisque rugulosæ, profunde incisæ ; *infimæ duæ* ad stipitem reliquis paulo majores, rectiores : *laciniis* lanceolatis, suboppositis, acuminatis ; *sterilibus* inferiorum pinnarum planis, exterioribus in quavis pinnula apice simplicibus, acutis, interioribus apice bifidis : *fertilibus* omnibus reflexis et fructificationes tegentibus ; *infimis duabus* in quavis pinnula ad nervum paulo majoribus, margine uno alterove dente præditis, apice plerumque bifidis ; *inferioribus* sequentibus apice bifidis, cum *superioribus* apice integris acutis, margine integerrimis. *Stipes* inferne nudus, basi sphacelatus nigricans, palcis fuscis linearibus hinc inde adspersus, hinc convexus, inde falcatus, inter frondem tetragonus, filiformis, strictus subflexuosus. *Pinnarum nervi* filiformes. *Fructificationum puncta* ex subrotundata ovata, ad basin internam laciniarum in aversa pagina solitaria, hinc in quavis pinnula biseriata, paribus quinque ad septem vel nonnunquam octo, laciniis pinnularum reflexis maxima ex parte occultata, tecta *Involucro* paleaceo, ferrugineo, e venula lateraliter ortum ducente, altero margine nervum pinnulæ respiciente libero, laciniato-fimbriato, tunc elevato et effusis capsulis demum replicato. *Capsulæ* subrotundæ, exiguæ, ruffæ, *annulo* atropurpureo tenui cinctæ, pedunculo recto insidentes, demum effusæ et ultra dimidiam laciniæ partem tegentes, punctis inter se non raro confluentibus.

β. *minus*, Doerr.

Frondes omnibus in partibus minores, vix pedem longæ. *Pinnæ*, pinnulis magis deflexis, conduplicatæ, plerumque læte virides. *Fructificationum puncta* demum minus confluentia.

(G, p. 258).

Descriptions of Asplenium obtusum, Adiantum-nigrum and acutum. By Sadler. (From De Filicibus Veris &c., p. 30).

Asplenium obtusum, Kit. Fronde ovato-triangulari basi bipinnatifida, medio bipinnata, apice simpliciter pinnata : pinnulis oblongis et laciniis obtusis

remotis, apice inæqualiter obtuse dentatis, rhachi alata. * * * 'E rhizomate horizontali fusco perpendiculariter descendunt radiculæ tenues fuscescentes. Stipites 3—4-pollicares basi fuscescentes canaliculati nitidi e rhizomate adscendunt. Rhachis viridis est et margine foliaceo-viridi cingitur. Frons 3—4-pollicaris ovato-triangularis, viridis ; siccatione obscurior evadens, bipinnata (*basi tripinnatifida*) est, pinnarum inferiorum pinnulis primariis pinnatifidis, laciniis cuneiformibus obtusis, apice inæqualiter dentatis, pinnulæ superiores etiam obtuse dentatæ sunt. Sori congenerum, in qualibet lacinia aut pinnula 3—4. Indusia membranacea.' Sadl. Adumbr. Epiph. l. c.

Asplenium Adiantum-nigrum, L. Fronde ovato-triangulari, basi bipinnatifida medio bipinnata, apice simpliciter pinnata, pinnulis oblongis et laciniis acutis approximatis acute dentatis, rhachi non alata. * * * E phrasi characteristica hujus plantæ et e descriptione præcedenti adnexa differentia harum adfinium specierum satis liquet.

Asplenium acutum, Bory. Fronde ovato-triangulari longe acuminata, pinnis pinnulisque oblongo-lanceolatis longe acuminatis, pinnis propriis et laciniis lanceolatis, approximatis, acute et profunde inciso-dentatis ; dentibus subbidenticulatis. * * * 'Radix et stipites Aspl. Ad. nigri : radix quippe dense fibrosa, fuscescens. Stipites ex una radice plures primum cum rhachide virides, demum profunde purpurascenti-fuscescentes, nitidi, supra sulcati. Frons—siccatione facillime nigrescens—½—1-pedalis, acutissime acuminata, inferius perfecte tripinnata, pinnis propriis acute incisis, in medio bipinnata, in apice rhachis longe producta, solum acute dentato-incisa est, quod idem de rhachidibus propriis pinnarum oblongo-lanceolatarum longe v. longissime productarum valet. Laciniæ omnes lanceolatæ, acutæ, acutissimæ et profunde inciso-dentatæ. Sori breves solitarii in laciniis, has demum obtegentes. Indusia membranacea.' Sadl. Epiph. l. c.

(H, p. 374).

Description of Lycopodium Selaginoides. By Wahlenberg. (From Flora Lapponica, p. 292).

Pulchella est species simulque ob duplicem fructum nostrarum maxime memorabilis. Caulis prope radicem valde tenuis est, et procumbens, surculos numerosos vagos decumbentes flexuosos subimplexos hypnoideos emittens ; denique vero sese erigit et incrassatur in rachidem clavæ fructiferæ erectæ bi- vel tri-pollicaris ramis L. Selaginis haud dissimilis. Folia caulis inferioris et surculorum parva sunt fere ut in Hypno squarroso L., patula, respectu tenuitatis satis rigidula et re vera dentato-spinulosa. Clavæ fructiferæ folia duplo triplove majora, concava, fere divergentia, et evidentius dentato-spinulosa.

Capsulæ semina graniformia includentes subquadricoccæ revera bivalves, sed interdum quadrifarium dehiscentes. Cocculi laterales simul inferius positi magisque ad latera protuberant quam cocculi medii altius positi. Semina semper quatuor, pro numero cocculorum, insertione sua convergentia et adeo compaginata ut mutua pressione areolæ triangulares ternæ in basi seminis singuli efformantur, qua re adeo seminibus *Isoëtidis lacustris* simillima, ut dum etiam pluribus respectubus conveniunt hæ plantæ de earum affinitate vix dubitare licet; magnitudine vix cedunt seminibus Papaveris, et semper integra e capsulis recedunt atque in terra dispertiuntur, quo clare patet ea antheras haud esse ut voluit Hedwigius.

Capsulæ seminulis pulveraceis repletæ in axillis foliorum superiorum inveniuntur, bivalves, eæque simillimæ capsulis fariniferis præcedentium specierum et Filicum bivalvium. Farina hæc e granulis hispidulis efficitur, quorum quatuor in tetraëdron connata sunt omnino ut semina capsularum inferiorum; quo maxima analogia oritur amborum ut nullum sit dubium quin ejusdem indolis sint. Si itaque farina in capsulis *Botrychii Lunariæ* semina sit, necesse est ut harum quoque capsularum pulvis vera semina erit. Pollen masculinum neutiquam esse potest quum seminibus maturis nuper descriptis omnino coætaneus est pulvis, idque in spica annua; semina unicum pulvere cadunt mense Julii vel initio Augusti, quo facto tota spica perit, et nova insequente anno nascitur e surculis, cujus nunc vix vestigium adest. Surculos hos eodem tempore scrupulose examinavi nec reperire potui minimum vestigium capsularum futurarum. Exinde sententia probabilior fieri mihi videtur, quod capsulæ hæ fariniferæ fructum quoque constituunt cujus seminula nonnisi minutie sua a cæteris seminibus differunt uti semina Spinaciæ diversæ formæ occurrunt.

ADVERTISEMENT. — *It should perhaps in conclusion be observed that the present volume is in some measure a second edition of my 'History of British Ferns,' published in* 1840; *but the alterations have been so great, and the additions so voluminous, that the two works must, I think, rank as perfectly distinct. I did not, however, venture on the present publication until the earlier volume had long been out of print.*

EDWARD NEWMAN, PRINTER, 9, DEVONSHIRE STREET, BISHOPSGATE.

WORKS ON NATURAL HISTORY,

PUBLISHED BY MR. VAN VOORST,

AND OF WHICH

EDWARD NEWMAN IS EITHER THE AUTHOR OR PROPRIETOR.

THE

SYSTEM OF NATURE.

By EDWARD NEWMAN.

SECOND EDITION.

In One Vol. 8*vo.*, *with Map of the Animal Kingdom, price* 10*s.*, *cloth,*

" Experience once recognized as the fountain of all our knowledge of Nature, it follows that, in the study of Nature and its laws, we ought to make up our minds to dismiss as idle prejudices, or at least suspend as premature, any preconceived notion of what might, or what ought to be, the order of Nature in any proposed case, and content ourselves with observing, as a plain matter of fact, what *is*.—*Herschell's Preliminary Discourse*, p. 79.

ALTHOUGH it is generally admitted that the solar system is not the work of man, to whose sagacity, however profound, we attribute nothing more than the discovery, yet in Natural History we have hitherto made scarcely an effort to *discover* a system, all the energies of our greatest naturalists — Aristotle, Linneus, Lamarck, Jussieu, and Cuvier — being exerted to *create* one. The *first* object therefore of this essay is to demonstrate the probability there is of the existence of a System of Nature wholly independent of the skill of man, — a system which, like its integral portions, owes its creation solely to the Almighty *Fiat*. The second and minor object is to draw from the labours of naturalists certain conclusions as to the probable characters of such a system, and to exhibit at one view, by means of a diagram, their applicability to the classification of the Animal Kingdom.

A FAMILIAR INTRODUCTION

TO THE

HISTORY OF INSECTS.

By EDWARD NEWMAN.

In cloth bds., 8vo., 12s.,

This work is illustrated by a profusion of engravings, executed in the first style of the art, from the author's own drawings on the wood. It is divided into four parts. The *first* gives a detailed account of the habits and manners of the most interesting insects, and a description of their wonderful transformations. The *second* treats of capturing, killing and preserving insects, and of constructing cabinets; the most ample details are given, and the author has taken especial pains to explain the most expeditious modes of killing insects, in order to inflict no unnecessary pain on the insects themselves, and also to save the feelings of the humane and kind-hearted, which are too often outraged by the modes in common use. In the *third* part the author describes, in an easy and popular manner, the structure of insects, using language which all may understand, yet never deviating from scientific accuracy: he has written for the public at large, and not for that learned but limited portion of the public to which the works of modern entomologists are exclusively addressed. The *fourth* part gives a sketch of the classification of insects; and the work concludes with an Alphabetical Index, each technical word having an explanation as well as reference; and in this part of the work are explained not merely the terms recommended for adoption, but also the objectionable terms in common use, pointing out the correct phrases recommended in their stead.

OPINIONS OF THE PRESS.

"The work throughout is clearly written, in many parts with animation and spirit—the result of an active mind distinctly perceiving what it intends to convey."—*Spectator, May* 29, 1841.

"A volume which is likely to be very serviceable to the beginner. It is very carefully illustrated by numerous and well-executed wood engravings."—*Morning Herald, June* 19, 1841.

"This volume, one of the best familiar introductions to Entomology we have met with, we recommend to those desirous of acquiring accurate elementary information on the history, general physiology, classification, and mode of preserving insects."—*Professor Jameson's Journal, October*, 1841.

"We have here a complete popular treatise. It is a kind of first book on Entomology, but may answer every purpose to nine-tenths of students."—*Tait's Edinburgh Magazine, June*, 1841.

"A very acceptable mixture of the *dulce et utile.* Mr. Newman does not take too much knowledge for granted, but, beginning at the beginning, fairly illustrates his subject. We cordially recommend his volume not only to entomological students, but to all lovers of animate Nature."—*Literary Gazette, June* 12, 1841.

"The charm of this volume is, that it is written in a frank and explanatory spirit, which will be quite as intelligible and as captivating to a child as to a man. There are no mysteries of science buried under ominous italics in its pages. Every definition is full — nothing is taken as granted — we are carried into the field of inquiry as if we had never heard of it before; and it is our fault, and not that of the writer, if we do not understand enough about Entomology, when we have closed the book, to tempt us to realize some further acquisitions for ourselves. The secret of all this consists in the simple but very important principle upon which the author has composed this treatise. He has presumed, at starting, that his readers know nothing whatever of the subject, and has written accordingly. There is no doubt that this is the proper way of writing introductions. It is the only way to make them achieve with complete success the end for which they are designed." — *Atlas, August* 14, 1841.

THE ZOOLOGIST:

A POPULAR JOURNAL OF FIELD NATURAL HISTORY.

On the 1*st of every Month, price* 1*s.*,

FROM his earliest boyhood the editor has been an admirer of White's 'Natural History of Selborne,' and has often longed for a collection of observations on similar subjects, written in a similar strain and spirit; not indeed like White's confined to one observer and one spot, but having no limit either in number of observers or range of observations: with this view he established 'The Zoologist,' and the good feeling with which it has been received is a sufficient proof that its plan is acceptable to "out-of-doors naturalists" — those who delight in observing the manners and habits, the private lives, the migrations, movements, nests, food and young of animals. The contributions are by

Atkinson, Rev. John
Atkinson, Rev. J. C., B.A.
Baird, W., M.D.
Banister, Rev. J. D.
Barclay, J. Gurney, Esq.
Bartlett, J. P., Esq.
Bates, H. W., Esq.
Bell, Robert John, Esq.
Bell, Thos., Esq., F.R.S.
Bladon, James, Esq.
Bond, Frederick, Esq.
Bree, Rev. W. T., M.A.
Briggs, J. J., Esq.
Bromfield, W. A., M.D., F.L.S.
Brown, Edwin, Esq.
Burlingham, D. C., Esq.
Bury, Rev. C. A.
Clifford, Rev. Frank
Cornish, J., Esq.
Couch, J., Esq., F.L.S.
Couch, R. Q., Esq.
Dawson, Rev. J. F.
Doubleday, E. Esq., F.L.S.
Doubleday, H., Esq.
Douglas, J. W., Esq.
Dowell, E. W., Esq.
Drummond, J. L., M.D.
Duncan, R. D., Esq.
Edleston, R. S., Esq.
Edmonston, T., jun., Esq.
Embleton, Robert, Esq.
Farr, Henry F., Esq.
Fisher, Marshall, Esq.
Fisher, W. R., Esq.
Gaze, W., Esq.
Gordon, Rev. G.
Gosse, P. H., Esq.
Gough, Thomas, Esq.
Gray, G. R., Esq.
Gray, J. E., Esq., F.R.S.
Greenwood, Alfred, Esq.
Greville, R. N., Esq.
Gurney, J. H., Esq.
Gurney, S., jun., Esq.
Harley, James, Esq.
Harrison, J. B., Esq.
Haslam, S. H., Esq.
Hepburn, A., Esq.
Heppenstall, John, Esq.
Hewett, William, Esq.
Hewitson, W. C., Esq.
Holland, A., Esq.
Holme, Frederick, Esq.
Hore, Rev. W. S.
Hussey, Rev. Arthur
Hoyer, J., Esq.
Jerdon, Archibald, Esq.
Jordan, R. C. R., Esq.
Jordan, W. R. H., Esq.
Kidd, Waring, Esq.
King, W. D., Esq.
Knox, A. E., Esq., M.A.
Lambert, Alfred, Esq.
Landsborough, Rev. D.
Lee, Melville, Esq.
Lighton, T., Esq.
Marshall, T., Esq.
Morris, B. R., M.D.
Morris, Rev. F. O., B.A.
Mosley, Sir Oswald, Bart., F.L.S.
Newman, Edward, F.L.S.
Newton, A. Esq.
Nicholson, C., Esq.
Norman, George, Esq.
Parsons, C., Esq., F.L.S.
Patterson, Robert, Esq.
Plant, J., Esq.
Quekett, John, Esq.
Reece, George, Esq.
Rodd, E. H., Esq.
Ross, F. W. L., Esq.
Salmon, J. D., Esq.
Saul, M., Esq.
Smith, Frederick, Esq.
Spicer, J. W. J., Esq.
Stephens, J. F., Esq., F.L.S
Stevens, Samuel, Esq.
Swaysland, George, Esq.
Thomas, W. H., Esq.
Thompson, William, Esq.
Tuke, J. H., Esq.
Tuke, W. M., Esq.
Turner, Rev. W.
Walker, F., Esq., F.L.S.
Walmesley, V., Esq.
Waterhouse, G. R., Esq.
Waterton, Charles, Esq.
White, Adam, Esq.
Willoughby, S., Esq.
Wilmot, J. P., Esq.
Wollaston, Vernon, Esq.
Worsley, Miss Anna
Yarrell, W., Esq., F.L.S.

☞ *Sixteen numbers are now published. The* 12 *dated in* 1843 *are neatly bound in cloth, lettered, and furnished with a complete Index, price* 13*s.*

THE ENTOMOLOGIST.

In One Volume, price 18*s.*, *cloth.*

Containing 424 pages, 16 copper-plates, engraved by T. Ingall, Esq., from drawings by A. H. Haliday, Esq., and many engravings on wood. The contributions by

Allis, Thomas H., Esq.
Bentley, William, Esq.
Bird, Rev. C. S., M.A., F.L.S., &c.
Bree, Rev. W. T., M.A.
Chant, John, Esq.
Dale, J. C., Esq., M.A., F.L.S., &c.
Davis, A. H., Esq., F.L.S., &c.
Doubleday, E., Esq., F.L.S., R.G.S., &c.
Doubleday, Henry, Esq.
Gosse, P. H., Esq.
Greville, R. K., Esq., LL.D., &c.
Haliday, A. H., Esq., M.A.
Harris, T. W., Esq., M.D., &c.
Hewitson, W. C., Esq.
Heysham, T. C., Esq.
Ingall, Thomas, Esq.
Lankester, E., Esq., M.D., F.L.S., &c.
Marshall, Thomas, Esq.
Newman, Edward, F.L.S.
Rusticus of Godalming.
Shuckard, W. E., Esq.
Stephens, J. F., Esq., F.L.S., Z.S., &c.
Walker, F., Esq., F.L.S., G.S., &c.
Waterhouse, G. R., Esq.
Westwood, J. O., Esq., F.L.S., &c.
White, Adam, Esq.

THE PHYTOLOGIST:

A POPULAR JOURNAL OF BRITISH BOTANY.

On the 1*st of every Month, price* 1*s.*

Conducted on the same plan as 'THE ZOOLOGIST,' and containing — in addition to many papers of sterling value by our very best botanists—a vast quantity of that useful and amusing chit-chat which is excluded from the graver journals. The pages of the 'History of British Ferns' show how useful 'The Phytologist' has proved as a source of information on every branch of the subject. The contributions by

C. C. Babington, Esq., M.A.
Professor Balfour, M.D.
Dr. Boott, F.L.S.
W. Borrer, Esq., F.L.S.
Rev. W. T. Bree, M.A.
J. B. Brichan, Esq.
Dr. Bromfield, F.L.S.
D. Cameron, Esq., A.L.S.
E. Forster, Esq., V. P.L.S.
S. Gibson, Esq.
Dr. Greville
Rev. W. S. Hore, M.A., F.L.S.
Rev. C. A. Johns, F.L.S.
Dr. Lankester, F.L.S.
Edwin Lees, Esq., F.L.S.
Rev. W. A. Leighton, B.A.
G. Luxford, Esq., A.L.S.
B. Maund, Esq., F.L.S.
E. Newman, F.L.S.
W. Pamplin, Esq., A.L.S.
W. Peete, Esq., F.L.S.
E. J. Quekett, Esq., F.L.S.
J. Ralfs, Esq.
W. A. Stables, Esq.
John Tatham, jun., Esq.
N. B. Ward, Esq., F.L.S.
H. C. Watson, Esq., F.L.S.
William Wilson, Esq.
Dr. Wood
J. Woods, Esq., F.L.S.

☞ *Thirty-six Numbers are already published.*

OTHER WORKS PUBLISHED BY MR. VAN VOORST.

PROFESSOR ANSTED'S GEOLOGY;

INTRODUCTORY, DESCRIPTIVE AND PRACTICAL.

Two vols. 8vo. Vol. I. price 21s. Vol. II. on September 1st.

THE NATURAL HISTORY, ANTIQUITIES, MANUFACTURES, &c., OF THE COUNTY OF STAFFORD.

By Robert Garner, F.L.S.—8vo., with many Illustrations, price 21s.

ANATOMICAL MANIPULATION;

Or, the Methods of pursuing Practical Investigations in Comparative Anatomy and Physiology. Also an Introduction to the Use of the Microscope, &c., and an Appendix.

By Alfred Tulk, M.R.C.S., M.E.S.; and Arthur Henfrey, A.L.S., M.Mic.S.

Foolscap 8vo., with Illustrative Diagrams, price 9s.

AIKIN'S CALENDAR OF NATURE;

OR NATURAL HISTORY OF EACH MONTH OF THE YEAR.

With additions by a Fellow of the Linnean and Zoological Societies, and eighteen designs by Cattermole. Small 8vo., 4s. 6d.

In ordering this volume "Cattermole's edition" should be particularly expressed.

GOLDSMITH'S VICAR OF WAKEFIELD.

With 32 illustrations, by William Mulready, R.A. Sq. 8vo, 1 guinea.

ELEGY IN A COUNTRY CHURCH-YARD. BY GRAY.

Each stanza illustrated with an engraving on wood, from thirty-three original drawings expressly made for the volume, by the most eminent Artists. Post 8vo, 9s.

A Polyglot Edition of this volume, with inter-paged translations in the Greek, Latin, German, Italian, and French languages. 12s.

THE BARD. BY GRAY.

With illustrations from drawings by the Hon. Mrs. John Talbot.—Uniform with the Elegy of Gray, to which it forms an appropriate companion volume. 7s.

A GENERAL OUTLINE OF THE ANIMAL KINGDOM AND MANUAL OF COMPARATIVE ANATOMY.

By T. Rymer Jones, F.Z.S., Professor of Comparative Anatomy in King's College, London; Fullerian Professor of Physiology in the Royal Institution of Great Britain; Examiner in Comparative Anatomy to the University of London. — In one thick vol. 8vo., containing nearly 350 Illustrations, 38s. Royal 8vo, £3. 16s., or Imperial 8vo, £5. 14s.

A HISTORY OF BRITISH QUADRUPEDS,

INCLUDING THE CETACEA.

By Thomas Bell, F.R.S., F.L.S., V.P.Z.S., etc., Professor of Zoology in King's College, London.

Nearly 200 Illustrations, 8vo., 28s. A few copies are also printed in Royal 8vo., price £2. 16s., and a very limited number in Imperial 8vo., price £4. 4s.

A HISTORY OF BRITISH BIRDS.

By William Yarrell, F.L.S., V.P.Z.S., etc.

This work contains a history and a picture portrait, engraved expressly for this work, of each species of the Birds found in Britain. The three volumes contain 520 illustrations. Price in Demy 8vo. £4. 10s.; Royal 8vo. £9.; or Imperial 8vo. £13. 10s. To suit the convenience of purchasers, the work will still be sold in volumes. Vol. I. price 28s.; Vol. II. 35s.; Vol. III. 30s.

A HISTORY OF BRITISH REPTILES.

By Thomas Bell, F.R.S., F.L.S., V.P.Z.S., etc., Professor of Zoology in King's College, London.

8vo. with more than 40 Illustrations, price 8s. 6d.; Royal 8vo. 17s.; or Imperial 8vo. 25s. 6d.

A HISTORY OF BRITISH FISHES.

By William Yarrell, F.L.S., V.P.Z.S., etc.

Second Edition, in two vols. Demy 8vo., illustrated by nearly 500 engravings, price £3. A Supplement to the First Edition, Demy 8vo. 7s. 6d.; Royal 8vo. 15s.; or Imperial 8vo. £1. 2s. 6d.

A HISTORY OF BRITISH STARFISHES, AND OTHER ANIMALS OF THE CLASS ECHINODERMATA.

By Edward Forbes, M.W.S., Professor of Botany in King's College, London.

8vo., with more than 120 Illustrations, 15s.; or Royal 8vo., 30s.

A HISTORY OF BRITISH FOREST-TREES,

INDIGENOUS AND INTRODUCED.

By Prideaux John Selby, F.L.S., M.W.S., etc.—Nearly 200 engravings. 8vo. 28s.; Royal 8vo. £2. 16s.

A NOMENCLATURE OF BRITISH BIRDS.

FOR LABELLING COLLECTIONS OF BRITISH BIRDS AND THEIR EGGS.

By Henry Doubleday.—Third Edition, 1s. 6d. sewed.

A GEOGRAPHICAL AND COMPARATIVE LIST OF THE BIRDS OF EUROPE AND NORTH AMERICA.

By Charles Lucien Bonaparte, Prince of Canino.—8vo. 5s.

A PAPER ON THE GROWTH OF THE SALMON IN FRESH WATER.

By Mr. Yarrell.

With six illustrations of the fish of the natural size, exhibiting its structure and exact appearance at various stages during the first two years. 12s. sewed.

AN ANGLER'S RAMBLES.

By Edward Jesse, F.L.S., Author of 'Gleanings in Natural History.'

Contents:—Thames Fishing.—Trolling in Staffordshire.—Perch Fishing-club. — Two Days' Fly-fishing on the Test. — Luckford Fishing-club. — Grayling Fishing.—A Visit to Oxford.—The Country Clergyman. Post 8vo., 10s. 6d.

VAN VOORST'S NATURALISTS' ALMANACK FOR 1844.

Price 1*s*.

"The principal feature in the present year's Almanack is the best and most compendious descriptive list of the British Ferns and their allies that we have yet met with."—*Phytologist for January.*

NOTES ON NETS;

OR, THE QUINCUNX PRACTICALLY CONSIDERED.

To which are added miscellaneous memoranda. By the Hon. and Rev. Chas. Bathurst, LL.D. late Fellow of All-Souls College, Oxford. 12mo. 4s.

HERALDRY OF FISH.

By Thomas Moule.—8vo., price 21s.; a few on large paper (Royal 8vo.) for colouring, price £2. 2s.

Nearly six hundred families are noticed in this work, and besides the several descriptions of fish, fishing-nets, and boats, are included also mermaids, tritons, and shell-fish. Nearly seventy ancient seals are described, and upwards of twenty subjects in stained glass. The engravings, two hundred and five in number, are from stained glass, tombs, sculpture and carving, medals and coins, rolls of arms, and pedigrees.

THE NATURAL HISTORY OF SELBORNE.

By the late Rev. Gilbert White, M.A.

A new edition, with notes by the Rev. Leonard Jenyns, M.A., F.L.S., etc.; with 26 Illustrations, Foolscap 8vo. 7s. 6d.

THE CANADIAN NATURALIST.

By Philip Henry Gosse, Cor. Mem. of the Nat. Hist. Soc. of Montreal, and of the Lit. and Hist. Soc. of Quebec.

Forty-four Illustrations of the most remarkable Animal and Vegetable productions. Post 8vo. 12s.

THE ORNITHOLOGIST'S GUIDE TO THE ISLANDS OF ORKNEY AND SHETLAND.

By Robert Dunn.—Post 8vo. 5s.

THE HONEY BEE;

ITS NATURAL HISTORY, PHYSIOLOGY, AND MANAGEMENT.

By Edward Bevan, M.D.
A new edition, 12mo., with many Illustrations, 10s. 6d.

THE NATURAL HISTORY OF THE SPERM WHALE,

AND A SKETCH OF A SOUTH SEA WHALING VOYAGE.

By Thomas Beale, late Surgeon to the "Kent," and "Sarah and Elizabeth," South Seamen. Post 8vo., 12s.

A CATALOGUE OF BRITISH FOSSILS.

Comprising all the genera and species hitherto described; with references to their geological distribution and to the localities in which they have been found.
By John Morris. 8vo., 10s.

A MANUAL OF BRITISH BOTANY;

Containing the Flowering Plants and Ferns, arranged according to the Natural orders. By Charles C. Babington, M.A., F.L.S., F.G.S., &c. 12mo., 9s.

A MANUAL OF BRITISH ALGÆ.

By the Hon. W. H. Harvey. Containing generic and specific descriptions of all the known British species of Sea-weed, and of Confervæ, both marine and fresh-water.—8vo., 9s.

A CORNISH FAUNA;

Being a compendium of the Natural History of the County. By Jonathan Couch, F.L.S., etc. 8vo. Parts 1 and 2, each 2s.

A FLORA OF SHROPSHIRE.

By W. A. Leighton, B.A., F.B.S.E., etc.—Comprising the Flowering Plants indigenous to the County, arranged on the Linnæan system. 8vo., 24s.

ON THE GROWTH OF PLANTS IN CLOSELY-GLAZED CASES.

By N. B. Ward, F.L.S.—8vo., 5s.

A FLORA OF THE NEIGHBOURHOOD OF REIGATE, SURREY;

CONTAINING THE FLOWERING PLANTS AND FERNS.

By George Luxford, A.L.S., F.B.S.E.—12mo. with a map of the district, 5s.

JOHN VAN VOORST, 1, PATERNOSTER ROW.